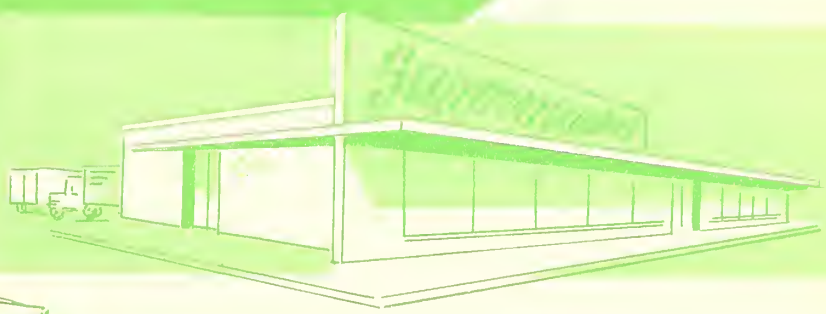
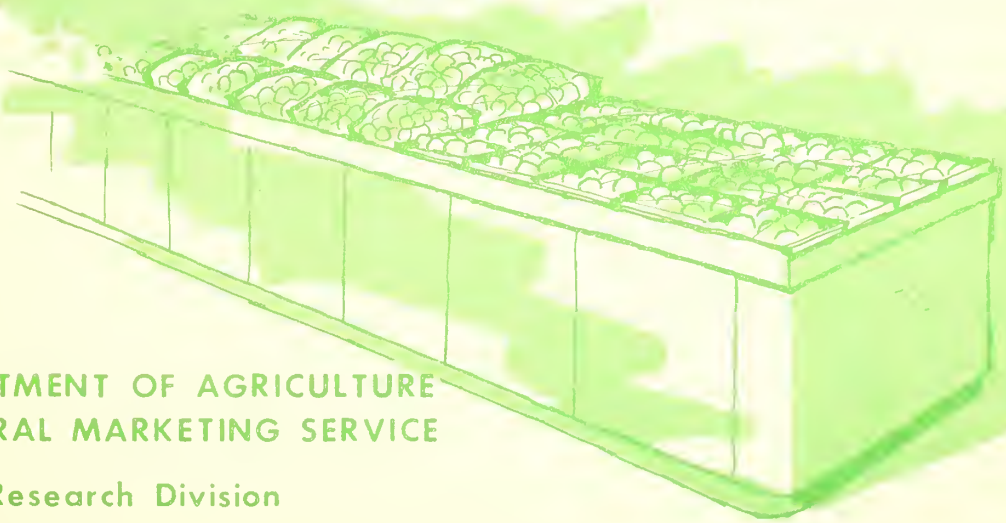
Packaging and Price-Marking Produce in Retail Food Stores



A Study of Improved Methods of Marketing Agricultural Products

Marketing Research Report No. 278



U. S. DEPARTMENT OF AGRICULTURE
AGRICULTURAL MARKETING SERVICE
Marketing Research Division

PREFACE

This study of packaging and price-marking produce in retail food stores is part of a broad program of research aimed at reducing the cost of marketing farm products, including development of methods of increasing the efficiency of food wholesaling and retailing.

The estimated total labor cost for operating produce departments in retail food stores was 400 million dollars in 1957. In the 5 years preceding 1957 average wage rates in food stores increased about one-fourth.

The methods and procedures described in this study, when adopted, will materially help to increase productivity of labor and increase the effectiveness and acceptability of self-service in food stores. As self-service holds down retailing costs, their burden on both producers and consumers is reduced, and the often wide spread between what the farmer gets for a commodity and what the consumer pays for it can be minimized.

Increases in marketing costs are normally reflected back to the farmer in lower returns, or to the consumer in higher prices, or both, as competition among traders gradually adjusts costs and margin levels. Reduction of these costs, therefore, can benefit all the factors in the food and fiber industries--producers, processors, distributors, and consumers.

ACKNOWLEDGMENTS

Personnel of Food Fair, Inc., Florida Division; Penn Fruit Co., Philadelphia, Pa.; Publix Markets, Lakeland, Fla.; Red Owl Stores, Inc., Hopkins, Minn.; and Super Valu Stores, Hopkins, Minn., built and installed equipment and allowed researchers to use the stores as laboratories for this study. Harold Friedland, Branch Manager, and Joseph Bloom, Director of Produce Operations of Food Fair, Florida Division, acted as consultants.

The study was conducted under the general direction of R. W. Hoecker, head, Wholesaling and Retailing Section, Transportation and Facilities Branch, Marketing Research Division, Agricultural Marketing Service.

October 1958

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PACKAGING AND PRICE-MARKING PRODUCE IN RETAIL FOOD STORES

A Study of Improved Methods of Marketing Agricultural Products

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SUMMARY

Improvements in packaging, price-marking, and unitizing of produce for self-service were installed in 4 supermarkets of 2 retail organizations. Weekly savings ranged from $22 in the supermarket with produce sales of $1,800 per week to $67 for the supermarket with produce sales of $6,450.

The least expensive method of wrapping packaged produce is by the use of the cellophane band or sleeve. Less labor and materials are used because two end seals are eliminated. Total packaging costs are 3.37 cents per package for the cellophane sleeve wrap with tray and 3.72 cents for overwrap and tray.

The most effective method of wrapping produce is the "nest" technique. The costs of labor and materials for this method of wrapping are 11 percent less than when using the seal plate, and 6 percent less than when the product is placed in the tray face up and the package is flipped over and sealed.

A packaging table was designed that required 36 percent less labor than a bench-type wrap station and 30 percent less labor than conventional individual wrap tables, or a saving of $3.67 and $2.71, respectively, per 1,000 packages wrapped. It incorporated the following principles: (1) All tools, materials, and product should be located close to and in front of the operator; (2) the table should be of proper height to permit alternate sitting and standing; (3) the employee should have access to unwrapped produce and be able to dispose of wrapped products without leaving the station; (4) gravity or conveyors should be utilized in moving product throughout the packaging operation; (5) the employee should be at ease with proper ventilation, light, and noise control; (6) each worker should have a separate workplace containing all the tools and supplies needed for wrapping; and (7) adequate conveyor areas should be provided before and after the wrapping stations for storage of product.

The method using the separate label printer and scale combination is the cheapest outside label operation for weighing and labeling packaged produce in a department whose volume ranges from 2,500 to 4,000 weighed packages per week. Where the weekly volume exceeds 4,000 packages (weighed and labeled), the electronic computer scale-printer is cheaper than a preprinted label and conventional prepack scale. Yearly savings for the electronic scale over the

conventional handling methods for different package volumes are $1,032 for 6,000 packages per week, $1,860 for 9,000 packages, and $2,685 for 12,000 packages.

Three methods of filling bags made of polyethylene, one of the most commonly used packaging materials, were studied: (1) By hand out of a shipping container; (2) by using a specially designed bagging table; and (3) by means of a semiautomatic bagging machine. Savings per 1,000 bags through use of the polyethylene bagging table compared with hand filling were $1.70. The semiautomatic bagging machine saved $3.10 per 1,000 bags as compared with a packaging table, and $4.80 as compared with hand filling methods.

The most efficient method for weighing and labeling a polyethylene bag depends on whether the bag is printed with a price spot or is a plain bag and whether it is filled to an approximate desired weight and priced according to its actual weight (catch weight), or filled to an even weight and priced accordingly. If catch weights are used, the separate label printer and scale combination is the least expensive method for a volume of 2,500 to 4,000 packages per week. The saving per 1,000 packages compared to writing the information on the bag is $2.30. For more than 4,000 packages per week the electronic computer scale printer is the cheapest method. For even-weight bags an adjustable stamp with code, commodity identification, weight, and price is the cheapest method of labeling the package. Compared with stamping the price on the bag and writing the code, commodity identification, and weight on the bag, the saving from use of this stamp was $4.20 per 1,000 bags.

Of the 6 methods tested for closing polyethylene bags, the one using pressure-sensitive crepe tape in a semiautomatic dispenser was the cheapest. This method cost $3.10 per 1,000 bags, compared with $7.04 for the most expensive operation in which a saddle tag was stapled over the mouth of the bag.

When apples are 23 cents per pound, up to 33 cents per box of size 150 or size 163 apples can be saved by individually price-marking each 3-pound (approximate) bag of apples, compared with hand filling and estimating the weight or machine filling and weighing and labeling the filled bag with the separate label printer and scale combination. In addition, all underweight bags are eliminated. This applies to all produce where the retailer has an option of estimating the weight by count or of weighing out and accurately pricing the item.

Packaging potatoes and onions on a semiautomatic bagging machine was the most efficient method of packaging these at the retail level. It was 14 percent more efficient than the most efficient hand filling method (using a hand scoop on a specially designed table) for 3-pound onions, 39 percent more efficient for 5-pound potatoes, and 45 percent more efficient for 10-pound potatoes. This machine is equally effective for bagging oranges, grapefruit, and apples, provided steps are taken to prevent bruising.

Seven methods of preparing bananas for sale were studied. Banding with gummed kraft tape and prepricing the bunches resulted in lower combined costs for labor, materials, and shrinkage than other methods.

When citrus is sold in bulk displays or in a bulk and packaged combination the most effective method of price-coding the bulk citrus is with a citrus coder developed by the research staff. Use of the citrus coder increased production by 150 percent for handling oranges and 60 percent for handling grapefruit.

The cheapest protective method of preparing lettuce was with the wire-enclosed paper tie placed around the head and secured. This prevents outer leaves from falling off but does not furnish as much protection as a transparent film. The cheapest method of completely wrapping lettuce is hand wrapping with cellophane. Costs of labor and materials for the wire-enclosed paper tie are $16.70 and for the hand-wrapped cellophane package $23.80 per 1,000 heads, a saving of $7.10 for the former.

An effective technique for selling watermelon quarters is to place cellophane diagonally over the exposed surface, wrap it around the melon, and tack-seal it on the bottom with a seal plate. This method costs 1.7 cents per quarter, as opposed to 1.8 cents for a face covering of polyvinyl (polyvinylidene chloride) film and 2.3 cents for a polyethylene bag.

A new holder for porous-tip stick-type stamps was designed in which the tips rested on an inked foam-rubber pad. This set is 16 percent more productive than the conventional stick-type stamp holder, 42 percent more productive than a self-inking adjustable stamp, and 240 percent more productive than pricing with a pen or grease pencil. Potential savings are $14.55 per 1,000 cases.

The extent of labor and materials saved in any given produce department will depend on sales volume, on the extent of prepricing and packaging, and most important, on methods and operating practices. A layout or a piece of equipment is only as good as the method used in performing a particular job.

INTRODUCTION

Paralleling the increase in numbers and size of superettes and supermarkets is a trend toward complete self-service in food stores. Increased prepackaging of produce is part of this trend. According to a recent survey conducted by a trade association, 33 percent of all supermarkets now sell all or nearly all fresh fruits and vegetables prepackaged (6). 1/ A trade magazine reports that merchandisers in a number of the 10 food chains having the largest sales estimate that in 1957 60 percent of all produce was sold prepackaged, with 70 percent expected in 1958 (4). The produce department accounts for 8 to 12 percent of sales in most retail food stores. Because of the perishability of produce, the margin to operate the department is one of the highest in food stores.

The purpose of this study was to evaluate existing produce packaging and price-marking procedures and to develop and test improved equipment, packaging and pricing methods, workplace arrangement, packaging materials, and work organization. Detailed studies were made in several stores belonging to each of 8 retail food chains. Additional studies of a more limited nature were made

1/ Underlined figures in parentheses refer to Literature Cited, p. 62.

of specific produce procedures in numerous other stores throughout the United States. Motion and time studies were made of each produce item or class of items with common handling techniques, to determine the time requirements for all the elements in the packaging function. Cost analysis and yield studies were made to evaluate materials used in produce departments.

Some of the results of this research have been published in previous reports. They are repeated here to allow comparison with results of new research and to bring together in one document the combined results of the study of produce packaging and price-marking at the retail level.

The methods, equipment, layouts, and materials reported here were developed, tested, and installed in stores of the cooperating retail food chains. It is believed that the research results reported in this study will afford most operators an opportunity to lower their packaging and price-marking costs even though they may be packaging a limited number of items. 2/

The term "self-service" as used in this report means the procedure whereby customers select their own purchases, and customers as well as checkout operators know the cost of each item selected. The latter is accomplished by price-marking the packages or other customer purchase units, and by display-pricing and price-coding the other individual units such as bulk grapefruit. Packaging is defined as placing a partial or total protective cover over the produce item(s). Price-marking is any method of indicating the unit price of a product, such as writing the code mark or the price on the item, or attaching a label to the item.

WRAPPING PRODUCE

The extent to which produce is placed in packages varies with the operator's conception of what packaging will do to increase sales or decrease shrinkage. Some stores wrap all produce in some type of protective cover; at the other extreme, some stores package as few items as possible and unit-price or code other items. The types and sizes of packages also vary greatly. The two basic types of packages considered here are film-wrapped packages and bags. Most stores use several types of packaging materials, chiefly polyethylene bags and cellophane. A store may even place an item in bags or open containers when it is relatively inexpensive or on sale, when otherwise it would be wrapped. Suggested materials and methods for packaging and price-marking specified fresh fruits and vegetables in various consumer packages at the retail level are presented in the appendix (tables 23 and 24).

Wrapping Materials

Just as there is no uniformity within the industry as to the types of package there is no set of rules as to the materials used when wrapping produce.

2/ This report is concerned with the in-store packaging of produce. Research is now underway to determine where produce can be packaged and priced at the lowest cost--the store, a central terminal, or a food distributor's warehouse.

The store may use different packaging materials for the same commodity. Studies were made on the following types of wrapped packages to determine the relative costs of materials and labor for each: Tray overwrapped with cellophane, tray wrapped with a band or sleeve of cellophane the width of the tray, backing board overwrapped with cellophane, and folding cartons with a cellophane window (fig. 1). The package wrapped with pressure-sensitive tape was also considered but was found to require about 14 percent higher costs for labor and 35 percent higher costs for materials than the sleeve-wrapped tray. (An overwrap is sealed at the ends as well as the sides of the package; a sleeve wrap is left open at the ends.)

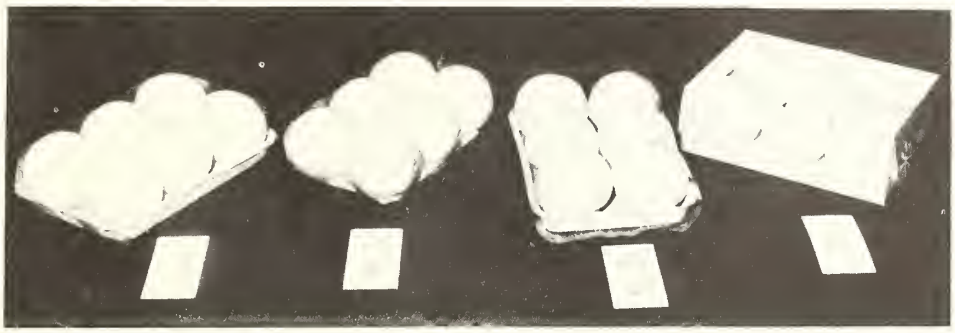

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Figure 1.--Four styles of packages for 6-pack oranges: (1) Overwrapped with tray; (2) overwrapped with backing board; (3) sleeve-wrapped with tray; and (4) folding window carton.

As indicated in figure 2, the cheapest method for wrapping a typical 6-unit package is the sleeve wrap. There is a saving in labor and cellophane, since the two end seals are eliminated. When heavier 450-gage cellophane is used to obtain a more rigid and better appearing tray than the usual 300-gage, the saving in cost of film disappears. 3/ The 300-gage cellophane becomes wrinkled and tends to sag around the fruit and lose its glossy appearance after a period of time on display.

Even with the more costly 450-gage cellophane, the sleeve has an advantage over the overwrap in that approximately 10 seconds less labor is required per package. This is an important factor when displays must be restocked and time is at a premium. The sleeve wrap is especially adaptable for such items as apples, pears, oranges, plums, and corn. In order to avoid having the merchandise roll around in the tray or fall out, the tray should be the right size for the produce packaged. For example, size 120 apples are just right for a No. 2 tray (see table 1) while size 100 are too large and size 135 too small. However, it is not always practical to fit the tray size to the produce.

3/ An 8- by 18-inch sheet of 450-gage cellophane at 6 cents per 1,000 square inches costs 0.82 cent as opposed to 0.73 cent for the 300-gage cellophane overwrap packages. The total packaging cost is 3.37 cents for the sleeve-wrapped package with 450-gage cellophane.

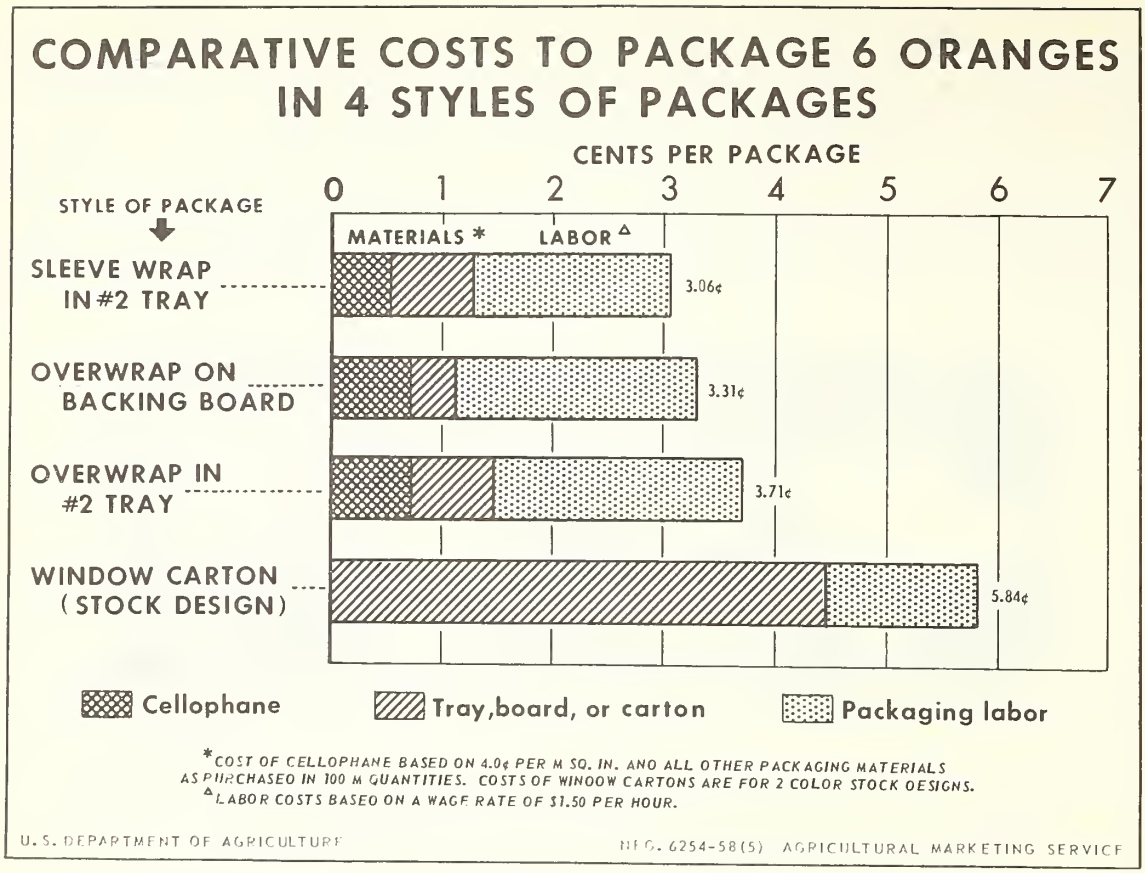

Figure 2.

Table 1.--Percentage of film saved by using diamond-shaped in place of square film for 3 styles of package fullness, by size of tray 1/

Reinforced paperboard tray, size--	Filled no higher than the top of the tray sides	Heaped 2 inches above the top of the tray sides	
		Curved heap	Square heap
	Percent	Percent	Percent
No. 0 (5x3x1").....	2.5	1.4	1.6
1 (5x5x1").....	-1.0	-1.0	-1.0
1-1/2 (8x3-1/2x1").	5.0	3.7	3.7
2 (8x5-1/2x1")..	1.9	1.5	1.4
5 (10x5x1").....	4.4	3.6	3.4

1/ Film requirements to derive these savings were computed for square sheets using $d = (2.8284 + s + t)0.5$ and for the 79° sheet using $e = (3.1412 + 1.2131s + t)0.5$ in which d is the length of the diagonal of the square sheet, e is the length of the long diagonal of the 79° sheet, s is the circumference of the package around its sides, and t is the circumference of the package around its ends. An explanation of these formulas and the method of deriving them is available on request.

The overwrap package is less expensive with a backing board than with a tray; the cost of material is 0.40 cent less for the package size equivalent to the No. 2 tray (fig. 2). The time required to wrap is the same as for the tray. A package with a backing board should be wrapped fairly tight and the board should be at least 30 point. The overwrapped backing board will not withstand handling as well as the overwrapped tray but it offers better visibility--the customer can see more of the item and produce personnel are better able to inspect the contents. It is not recommended for such items as tomatoes and peaches.

The cellophane window-type folding carton affords more protection for the merchandise than the types of packages previously discussed. The window cartons can be stacked higher without damaging the contents. Since the operation consists of only filling and closing the carton, the packaging time is low. The window carton affords less visibility than the other packages, thereby making more difficult the inspection of the contents of the packages. The high cost of the carton restricts its use except perhaps for perishable items with high unit cost.

The cellophane sleeve wrap is the cheapest package. However, the cellophane overwrapped tray has a better initial appearance and greater resistance to repeated handlings.

Type, Shape, and Size of Film

No attempt was made during the study to evaluate various types of film for wrapping produce. An analysis of the literature on wrapping films indicated that a cellophane which is partially moisture protective and water resistant for wet or moist products, as well as heat sealable, is equal in quality to the best films available for the packaging of most items. Extensive tests conducted by the U. S. Department of Agriculture with 27 different films on 11 different vegetables have demonstrated that the type of film is not as important as ventilation of the package and adequate refrigeration (7). In this study most of the cellophane was perforated, usually with four 1/4-inch holes.

The diagonal wrap with square sheets of film is often used in wrapping produce (fig. 3) and is well suited for square packages. However, most produce packages are rectangular. To provide for this, rectangular sheets of cellophane with 1-inch greater length than width were substituted for the square sheets, but no noticeable savings resulted. In another attempt to meet the needs for wrapping the rectangular package, a 79° diamond-shaped film sheet, the only diamond shape now offered on the market (fig. 4), was analyzed to measure amounts of film required in comparison with square sheets. The amount of film saved by using this diamond-shaped sheet depends upon the shape of the tray being packaged. This diamond shape does not use the smallest quantity of film with square trays such as the No. 1 tray, but for all commonly used rectangular-shaped trays, film can be saved by using it.

The exact amount of such saving for rectangular trays of any particular size depends upon the fullness of the package. The maximum amount of film is saved by using the diamond shape when the rectangular tray is filled no higher

than its sides. As the contents are heaped above the sides of the tray, the savings from diamond-shaped film decrease. This is illustrated (table 1) by the percentage savings from use of diamond film instead of square film for 5 sizes of reinforced paperboard trays commonly used for produce packaging and for 3 levels of fullness of package. These 3 levels of package fullness were: (1) Contents are not piled higher than the top edges of the sides of the tray, resulting in a flat form; (2) contents are heaped 2 inches above the top edges of the sides at the center of the tray and curved down to their level at the edges; (3) contents are heaped 2 inches above the top edges of the sides of the tray, in a square heap. It is unusual in produce prepackaging to heap packages as high as 2 inches above the level of the top edge of the sides. Therefore, the savings shown for the packages heaped 2 inches above the sides are about the minimum savings that would result from using diamond-shaped film. Usually more saving is gained on the curved heap than on the square heap.

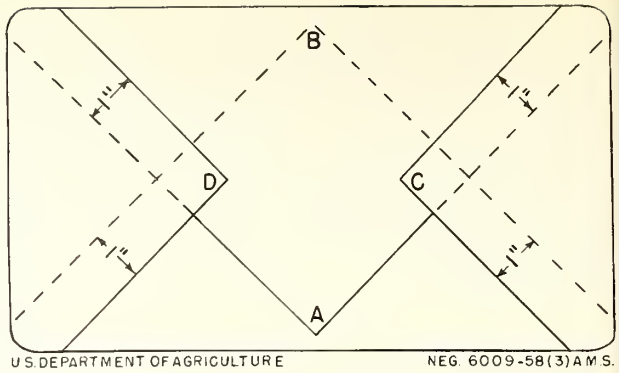

Figure 3.--The diagonal wrap showing the 3 seals and the 1-inch minimum overlap for seals C and D.

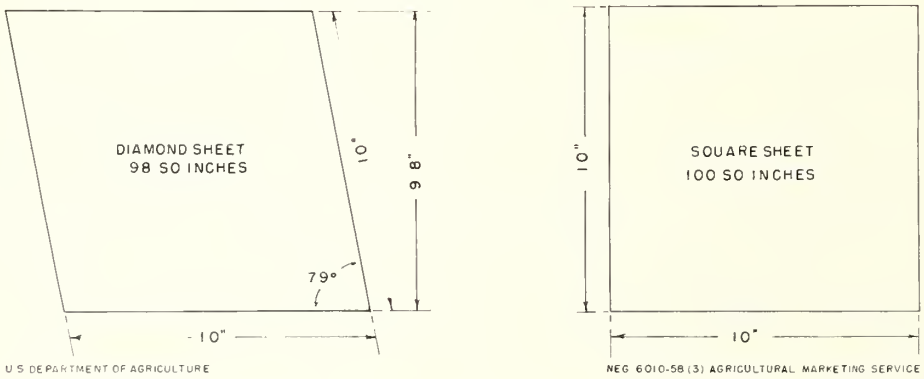

Figure 4.--Two shapes of cellophane used in overwrapping produce. Note comparative area of the 2 sheets which can be used to wrap identical packages in the No. 0 trays.

The dollar value of film saved by using diamond-shaped film depends upon the ratio in which trays of the various sizes are used as well as upon how much is put in them. It would also depend upon whether square film was stocked and used for wrapping items in square trays. The experience of one supermarket operator is illustrative of the dollar savings that can be obtained. During a 13-week period in February, March, April, and May, the produce department in this large supermarket used the following sizes of reinforced paperboard trays in the proportions listed:

Size of tray	Percent
No. 0	5.5
No. 1	33.3
No. 1-1/2	18.8
No. 2	32.4
No. 5	10.0
Total	100.0

If this operator had wrapped the No. 1 trays in square film and the other 4 sizes of trays in diamond-shaped film, he would have saved between 12 and 14 cents in film costs per thousand packages, depending upon how full the packages were filled. 4/ But to keep a stock of square film merely to wrap square packages might prove more troublesome and costly than to wrap all packages in diamond film. If this operator had used only diamond-shaped film during the 13-week period, he would have saved between 11 and 12 cents per thousand packages. These figures are based on the requirement of at least 1-inch overlap on the 2 end seals (fig. 3).

If a price differential should exist in the market in favor of film of either shape, it may be large enough to be the real deciding factor as to which shape should be used.

The size of film used to wrap a given package will affect costs of both labor and materials. If the film is too small, additional labor is required to wrap the package. Sometimes the added labor more than offsets any saving in cost of film. If the film is too large, sealing is more difficult and costs of both labor and materials are increased. In one test, time studies of a minimum of 50 packages of 3 commodities, apples, pears, and tomatoes, were wrapped in 11- by 12-inch film and 13- by 14-inch film (table 2). While about the same amount of labor was required to seal the packages, the added cost of the larger film resulted in an increased cost of 17 percent or $1.80 per 1,000 packages.

In another test 2 sizes of diamond-shaped film were used to wrap size 200 oranges in No. 0 trays. In this test the 9- by 9-inch film was too small, and lower film costs were more than offset by higher labor costs (table 3).

Both pulp-type and reinforced paperboard trays were used. The pulp-type tray offered more rigidity but lacked the flexibility of the paperboard tray. For example, 6 size 120 apples in a pulp-type tray made an excellent package, whereas 6 size 100 apples were too large and 6 size 135 apples rolled about in the package. The paperboard tray will expand some to accommodate size 100 apples and can be contracted by film to give a tight wrap for size 135 apples. The pulp tray seems to be better suited to the sleeve wrap package, especially when the produce is properly sized.

The pulp tray requires more film for both sleeve and complete overwrap packages because of the 1/4-inch molded lip surrounding the tray. Because of the lip, more space was required to display a given quantity of produce when

4/ The saving described is based on the assumption that on the average the packages are not filled higher than 2 inches above the sides of the trays.

Table 2.--Times and comparative costs for wrapping same size packages with different sizes of film

Item	11- by 12-inch film				13- by 14-inch film			
	Seal A and B 1/	Seal C	Seal D	Total	Seal A and B 1/	Seal C	Seal D	Total
	Sec.	Sec.	Sec.	Sec.	Sec.	Sec.	Sec.	Sec.
4 apples in No. 1 tray	4.8	3.4	3.9	12.1	4.9	3.8	4.0	12.7
4 pears in No. 1 tray	5.4	4.2	4.7	14.3	4.1	3.4	4.1	11.6
4 tomatoes in No. 1 tray	5.0	3.5	4.3	12.8	5.3	3.9	3.8	13.0
Average seconds per package for 3 seals	--	--	--	13.1	--	--	--	12.4
Cost per package at 2.5¢ per minute	--	--	--	.54¢	--	--	--	.52¢
Cellophane cost per package at 4.0¢ per 1,000 sq. in.	--	--	--	.53¢	--	--	--	.73¢
Cost per package for labor and materials	--	--	--	1.07¢	--	--	--	1.25¢

1/ A and B are the corners of film extending around the sides of the package, and C and D are the corners extending around the ends (fig. 3).

Table 3.--Costs of labor and materials to wrap size 200 oranges in No. 0 pulp trays with different size diamond-shaped cellophane

Cost element	Nominal size	
	9 by 9 inches	10 by 10 inches
Time per package.....seconds	18.3	14.8
Labor cost at 2.5 cents per minute.....cents	.76	.62
Cellophane cost.....cents	.29	.36
Labor and film cost.....cents	1.05	.98

using the pulp-type tray. However, the lip affords more protection against bruising. This lip adds about 1/2 inch to the distance around the package at the sides and also end to end. About 8.3 square inches more film is required to cover the No. 2 pulp tray and about 6.6 square inches more is required to cover the No. 1 pulp tray, compared with the paperboard tray. 5/

5/ Based on formula in footnote 1, table 1.

Wrapping Methods

Three methods of wrapping produce were studied. In the procedure for the first method, designated as the "nest" method, an empty nest tray the same size as the tray to be used in the package is positioned on the wrap station in a convenient location. A sheet of cellophane is then placed diagonally over the nest tray. Merchandise is placed in the nest face down. When the tray is full an empty tray or board is placed over the merchandise, sides A and B are brought together over the tray and sealed with a hand iron, and then each end is sealed (fig. 5). The same procedure is followed for a sleeve wrap except that the 2 ends are not sealed.

The second method is called the "flip-over" technique. The empty tray is first placed on the wrap station. Produce is placed in the tray face up and a sheet of cellophane is placed diagonally over the merchandise. Grasping the two sides of the film, the operator quickly flips the package over. He seals sides A and B and then the two ends with a hand iron (fig. 5b and c). The flip-over method is not normally used for sleeve-wrapping.

The last method is called the "seal plate" technique of overwrapping. The tray is positioned and filled and film is placed over the merchandise, as in the flip-over method. The operator then tilts the package enough to place side A over the bottom. He positions side B over A, and grasps the point of film extending beyond the package and pulls it tight. Holding the package this way, he slides it onto a seal plate and leaves it there momentarily while the thermoplastic substance on the film is activated. He then grasps end C, folds it under one end of the tray, and again slides the package onto and off the seal plate. He pulls end D tight to insure a tight wrap, folds it under the other end of the tray, and slides the package onto and off the seal plate. When the seal plate is used to sleeve-wrap produce, the operator fills the tray and places it on one end of the film, which is positioned in front of the seal plate. He grasps the end of the film farthest from the seal plate and pulls it over the package, which is tilted, and places it between the bottom of the tray and the other end of the film. He then grasps this end of the film, pulls it tight, and, while holding the protruding edges of the film, slides the package onto the seal plate. It is usually necessary to make two seals, the second one to seal the protruding film (fig. 6).

A comparison of the costs of labor and materials for overwrapping by the 3 previously mentioned techniques reveals that the total cost of the nest method is 6 percent lower than the flip-over method and 11 percent lower than the seal plate method (fig. 7). The higher labor cost for wrapping with the nest method is compensated by low film costs because a smaller sheet of film can be used efficiently in the nest method.

Hand Iron vs. Seal Plate

In order to better enable a retailer to determine whether he should use the seal plate or the hand iron, studies were made of the time requirements for sealing elements and the film used for 9 representative items in trays of

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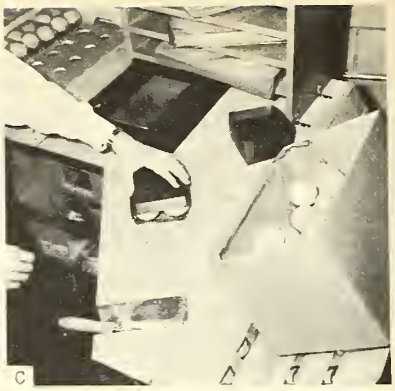
BN-5927



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BN-5897

BN-5922

BN-5923

Figure 5.--Steps in overwrapping produce using the nest technique: (a) Cellophane positioned on nest tray; (b) tray filled; (c) tray for the package positioned over the merchandise; (d) sealing the first 2 corners of the cellophane; (e) sealing the third end of the cellophane; (f) sealing the fourth end of the cellophane; and (g) putting away the wrapped package and reaching for the cellophane for the next package.

BN-5875

Place filled tray on cellophane

BN-5878

Lay cellophane over top of tray and secure

BN-5877

Seal on plate

Figure 6.--Cellophane sleeve-wrapping apples in a No. 2 tray on a seal plate.

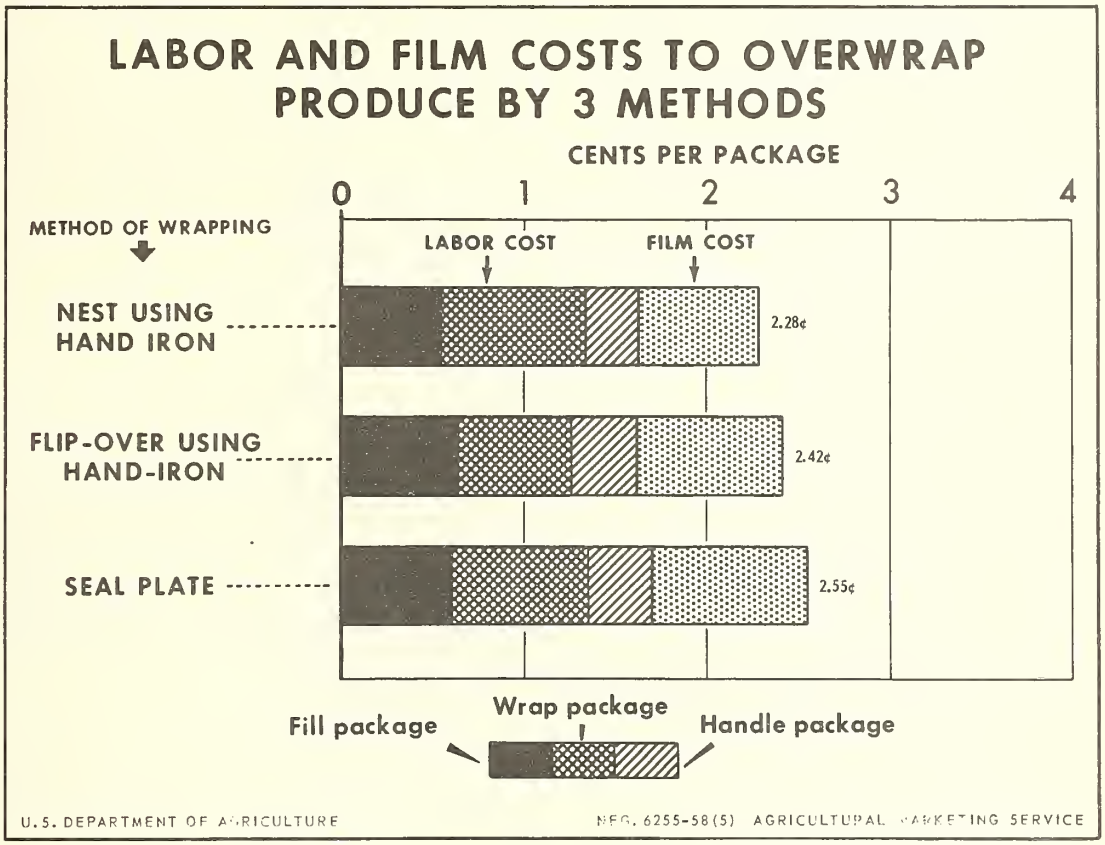


Figure 7.

different sizes. The technique of using the seal plate is described in the preceding section. (On smaller packages a skilled operator is able to seal three corners of the film in one operation.) The hand iron was not laid down between seals, because laying it down would require an average of 13 percent more labor. Although the labor costs are less for the seal plate, film costs

are lower for the hand iron, resulting in 7.6 percent lower total costs using the hand iron. For 1,000 packages, the saving would be $1.20 (table 4).

Table 4.--Comparative costs of labor and materials for sealing elements when using seal plate and hand iron for wrapping selected produce items

Tray size and commodity	Seal plate			Hand iron		
	Labor	Film	Total	Labor	Film	Total
	Cents	Cents	Cents	Cents	Cents	Cents
No. 2 tray:						
Pears (6)	1/ 0.92	0.90	1.82	0.81	0.73	1.54
Peaches (6)	.76	.90	1.66	.71	.73	1.44
Apples (6)	.50	.90	1.40	.78	.73	1.51
Lemons (6)	.82	.90	1.72	.89	.73	1.62
Beans (1.1 lb.)	.88	.90	1.78	1.10	.73	1.83
No. 1-1/2 tray:						
Plums (6)	.71	.68	1.39	.69	.53	1.22
Grapes (1.2 lb.)	.63	.90	1.53	1.03	.53	1.56
Cherries (.9 lb.)	.98	.68	1.66	.85	.53	1.38
No. 1 tray:						
Tomatoes (4)	.57	.68	1.25	.50	.53	1.03
Average	.75	.83	1.58	.82	.64	1.46

1/ Labor costs based on $1.50 per hour.

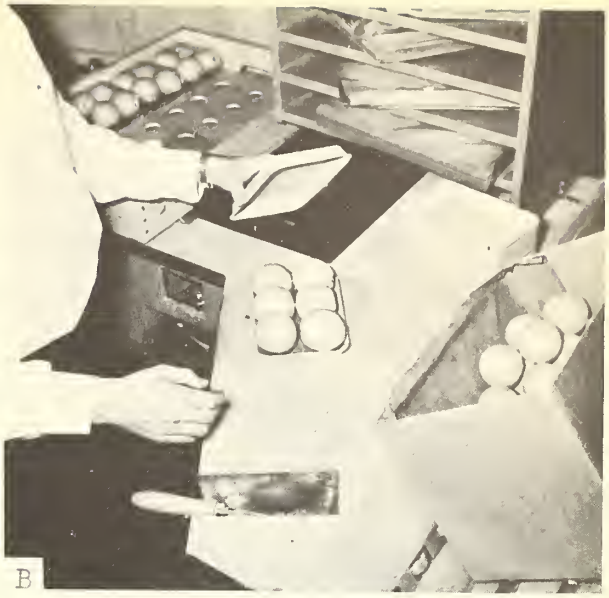
Sleeve-Wrapping Methods

Three methods of sleeve-wrapping were tested, two of which, the nest method using the hand iron (fig. 8) and the seal plate method, are described in the preceding section. In the third method, rolled rubber hydrochloride film (Pliofilm) was used in conjunction with a seal plate assembly called a wrapping aid device. The operator placed the filled package on the film so that sufficient film was available to pass over the tray and make a seal on the underside of the tray. Holding the end of the film in place on each side of the package, he picked it up and moved it toward himself. He cut the film on a heated wire and lowered the package onto a seal plate (fig. 9).

Studies were made to determine which method and material were cheapest for sleeve wrapping. In one test, trays of 6 size 120 apples were wrapped by each method. The labor requirements for the wrapping aid were 5 percent less than with the sleeve wrap and the seal plate, and 11 percent less than with the hand iron and nest (table 5). Costs of film with the seal plate were 14 percent higher than with the hand iron and nest and 7 percent higher than with the wrapping aid. The net result is that the total cost using the wrapping aid is 2 percent less than for the hand iron and nest and 6 percent less than for the seal plate.

BN-5893

Cellophane in position on the nest tray



BN-5898

Placing the package tray over the fruit

BN-5929

Sealing the package with the hand iron

Figure 8.--Sleeve-wrapping with the hand iron.

BN-5889

Position filled tray on film and grasp edge of film

BN-5888

Fold film over tray

BN-5886

Move package back and cut film on hot wire

BN-5885

Seal package on seal plate

Figure 9.--Using a wrapping aid for sleeve-wrapping of oranges in No. 2 trays.

Table 5.--Comparative labor and materials costs to sleeve-wrap 6 size 120 apples in a No. 2 tray by 3 wrapping methods

Operation	Seal plate, cellophane	Hand iron, nest, cellophane	Wrapping aid, Pliofilm
	Seconds	Seconds	Seconds
Position film and tray and wrap film over tray	4.3	--	--
Seal on plate and dispose of package	4.3	--	--
Dispose of package and position film over nest for next package	--	3.5	--
Position film ends, pick up iron, seal package, and return iron to table	--	5.6	--
Position package on film and fold film over package	--	--	3.2
Pull package forward, cut film, seal and dispose of package	--	--	5.1
Total wrap elements in seconds	8.6	9.1	8.3
Personal and fatigue allowance, 15 percent	1.3	1.4	1.2
Standard time	9.9	10.5	9.5
	Cents	Cents	Cents
Labor cost at 2.5¢ per minute	.41	.44	.39
Film cost per package	1/ .58	2/ .51	3/ .54
Total labor and film cost per package	.99	.95	.93

1/ 8x18 film 300 gage @ 4.0¢ per 1,000 sq. in.
2/ 8x16 film 300 gage @ 4.0¢ per 1,000 sq. in.
3/ Average sheet of film was 16.5 in. long from 8 in. roll, or 132 sq. in., @ 4.1¢ per 1,000 sq. in.

The Wrapping Station

The design of the work area for the overwrapping operation should incorporate features to facilitate wrapping by the best methods previously discussed and should be based on well-known principles of motion economy. Studies have indicated that the nest technique with the hand iron for sealing the package affords the cheapest packaging operation for both overwrapping and sleeve-wrapping. Hence, for this technique provision must be made on the wrap station for hand iron, unwrapped merchandise, film, trays and boards, and master containers in which the wrapped package is to be placed. The principles which will guide in the design of the workplace are:

1. All tools, materials, and produce should be located close to and in front of the operator.

2. Adequate storage should be provided for all film, boards, trays, and flats, and the most commonly used supplies should be most convenient to obtain.

3. The table should be of proper height for alternate sitting and standing, and an adjustable stool with back and foot rest should be provided for the operator. The proper height for the average person is 38 inches, but both stool and table should be adjustable to accommodate each operator.

4. The employee should be able to reach unwrapped produce and dispose of wrapped produce without leaving the station.

5. Gravity or conveyors should be utilized to move the product. This eliminates carrying and walking. This is especially important when operators are women. Produce master containers are usually heavier than women should lift.

6. The employee should be at ease, with proper ventilation, noise control, and proper light to enable him to inspect all produce as it is placed in the package.

A table (the Redi-Reach-Rap table) based on the preceding principles was designed for the wrapping operation. The first step was to lay out the optimum and maximum work areas (3) and then arrange materials, product, and equipment within these areas to provide the best sequence of motions (fig. 10).

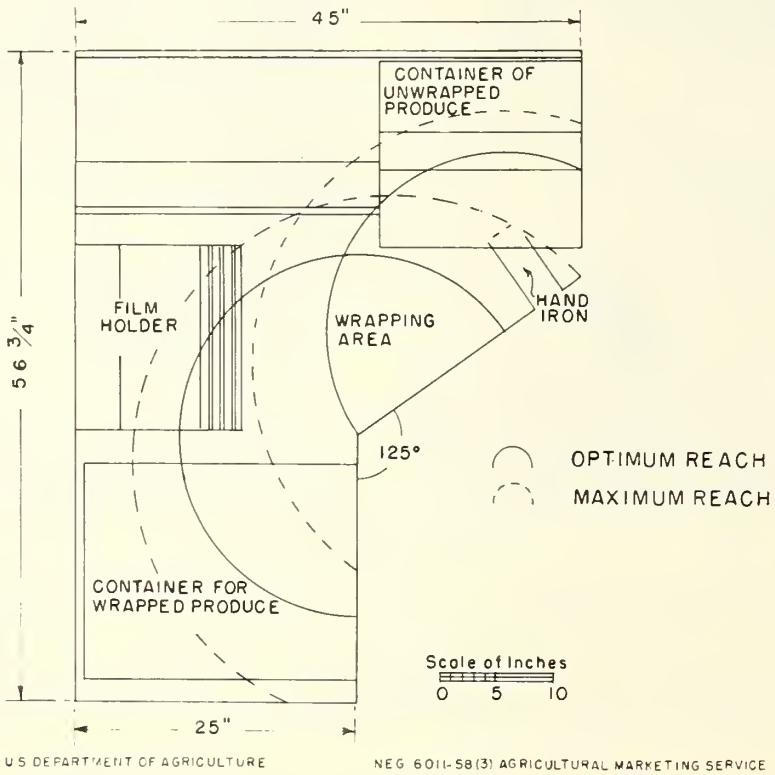
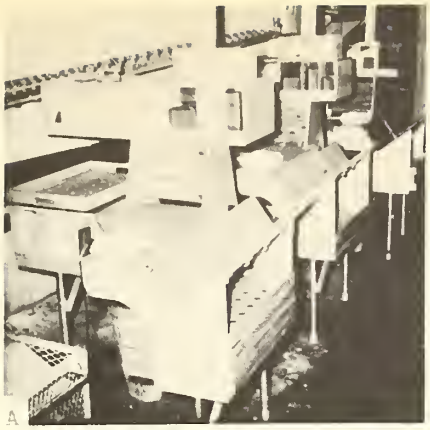
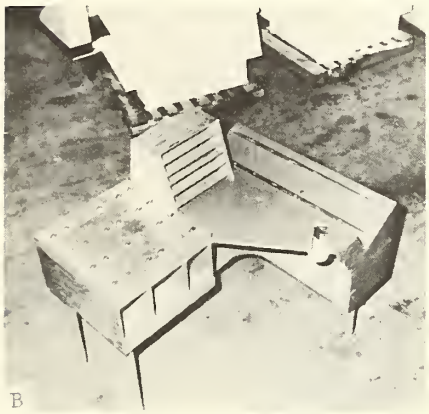


Figure 10.--Layout of a produce packaging table showing optimum and maximum work areas.



BN-5884
Line of 3 stations



BN-5871
Note location of iron well

BN-5880
Wrapping station in use

Figure 11.--The Redi-Reach-Rap table for packaging produce.

(Detailed drawings of Redi-Reach-Rap table and its parts are shown in appendix, figures 43, 44, and 45.) Four sizes of sheeted film were placed in sloped tiers to the left front of the operator. Trays and boards were located in a rack above the film holder with the most commonly used sizes nearest the operator. Unwrapped merchandise was located on a 30° inclined shelf to the right front of the operator. This shelf had a capacity of about 3 master containers--boxes, crates, or cartons. The wrapped packages were placed on a flat (a container which held approximately 20 No. 2 and 26 No. 1 trays of wrapped produce). 6/ This flat sat on rollers and was readily pushed onto a conveyor which moved the wrapped merchandise to the weighing station. Empty flats were stored on a shelf under the wrapping table at the operator's right. The hand iron, used for sealing packages, was located in a recessed asbestos holder to the right of the operator (fig. 11).

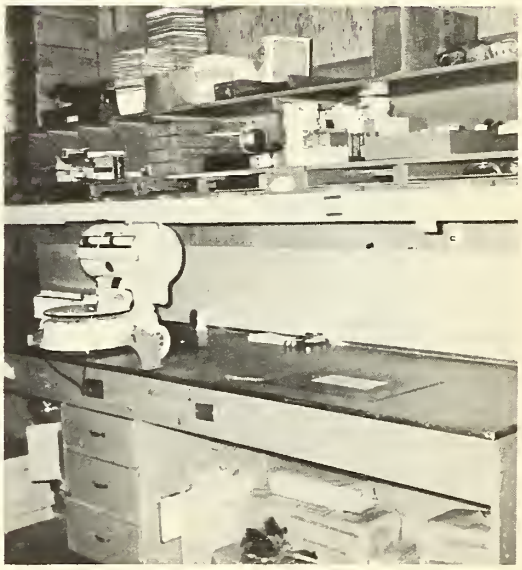
The table was 38 inches high with an inch and a half adjustment in height provided by the bell feet threaded to the lower ends of the legs. An adjustable stool with back and foot rests was provided for each wrap station. This wrap station has recently been modified to include an 8-inch-wide roll of cellophane for sleeve wrapping mounted under the table and feeding to a dispenser directly under the film holder. The table may have a seal plate incorporated in the surface to the left front of the operator, for overwrapping lettuce and other items that require similar wrap.

6/ For construction details of the flat or packaged produce container tray see appendix, figure 46.

This wrap station was compared with 2 other types of wrapping tables, bench-type tables and individual rectangular tables. The packaging operations that were affected by the wrap table design were (1) obtaining film and trays or boards, (2) placing unwrapped merchandise in trays or nests, (3) placing wrapped package in master container (henceforth called a flat), and (4) handling salvage containers and flats.

In the bench wrapping operation (fig. 12), the operator obtained film from a tray above the wrap surface and placed packages on the surface at his left until he finished all of the packages of one commodity or until the holding area was full; then he placed two packages at a time in a wire basket at his right, and filled trays and stacked them on the table to the right of the wrap area.

When wrapping on a conventional rectangular packaging table (fig. 13), the operator obtained a supply of film and placed it on the table to the left of the wrapping area. He placed packages in a wire basket on his left. Trays were filled in a separate area and moved by conveyor to the wrap tables on metal trays or platters.



BN-5895

Figure 12.--A bench-type produce packaging work table.

BN-5900

Figure 13.--Individual wrap station of rectangular design.

When using the Redi-Reach-Rap table the operator placed the wrapped package in a flat on his left with the left hand, while taking a sheet of film with his right hand from a tiered rack at the left front (fig. 5g). A metal plate the size of the tray used had previously been placed in the nest tray to prevent it from moving while the film was being positioned. The operator placed the film diagonally over the nest tray. He filled the tray, using both hands simultaneously to take merchandise from the shipping containers and place it face down on the film. Then he placed an empty tray or board over the product and wrapped the package.

Special nests were designed for the wrapping of such bulky packages as spinach and beans. Removing the package from the nest to facilitate sealing C and D required an average of 2.4 seconds less per package than making the seal in the nest. When individual produce items such as apples and pears were packed in protective wrappers which had to be removed before trays were filled, an average of 3.1 minutes per container was required for the operation. When unwrapped produce was dumped from the shipping container (size 120 apples) into a plastic tub or a box somewhat larger than the original container, 1.6 minutes or 52 percent less time was required. Filling the trays with two hands simultaneously required 22 percent less time than the conventional hand-to-hand pass.

Empty shipping containers, boxes, crates, and cartons were placed on a conveyor and moved to an assembly area where they were broken down and placed in racks or, if salvageable, were stacked.

For comparable elements, the Redi-Reach-Rap station required 36 percent less labor than the bench wrap station and 30 percent less labor than the conventional packaging table. Labor savings per 1,000 packages were $3.67 compared to the bench wrap station and $2.71 compared to the conventional table (table 6).

Table 6.--Comparative time per package required to obtain film, fill trays, dispose of wrapped package, and handle salvage containers and flats on 3 types of packaging stations

Packaging operation	Bench wrapping station	Conventional packaging table	Redi-Reach-Rap station
	Seconds	Seconds	Seconds
Obtain film	4.4	3.6	1/ 3.5
Dispose of wrapped package	3.2	2/ 2.6	--
Fill tray or nest	12.3	3/ 11.4	9.3
Handle container and flat	4/ 1.2	1.5	.7
Total time per package	21.1	19.1	13.5
Personal and fatigue allowance 15 percent	3.2	2.9	2.0
Total	24.3	22.0	15.5
Cost per 1,000 packages wrapped at 2.5¢ per minute 5/	$10.13	$9.17	$6.46

1/ Includes time required to dispose of package. These elements when performed separately required 2.9 seconds to obtain film and 2.6 seconds to dispose of wrapped package.

2/ Package was dropped into a wire basket. This time does not reflect the additional time required to remove package from basket.

3/ Trays were filled in a separate operation and moved on flats to the wrap station.

4/ All studies based on an average of 20 packages wrapped per master container.

5/ This cost does not reflect the time to wrap the package or perform other miscellaneous tasks which are not affected by the design of the wrap station. The fact that the Redi-Reach-Rap station is at the proper height, that the wrapping area is ideally located in the optimum work area for 2-handed work, that the operator could alternatively sit or stand, thereby becoming less tired, and that the hand iron was ideally located, all contribute to the effectiveness of the wrap station but were not measured in this study.

Weighing and Labeling

There are a great many ways to price-mark and label packaged produce, varying from a stamped impression to those which are printed by machine. There is also a great deal of variation in the information placed on the label to indicate the price, due in part to local and State regulations controlling weights and measures. In some localities the retailer is required only to place the price on the package; in other localities he must identify the commodity in the package as well as the price per pound, weight to the nearest quarter ounce, and package price. Some packages are marked with a standard price per package; others are weighed and then price-marked. Studies were made to determine the cheapest method of weighing and labeling produce for 4 levels of weekly volume. In order to make these studies comparable certain assumptions were necessary: First, all packages are weighed; second, at least the price per pound, the weight, and the package price must be on the label; third, an outside label will be used for packaged produce because of the difficulty of holding an inside label in place during wrapping.

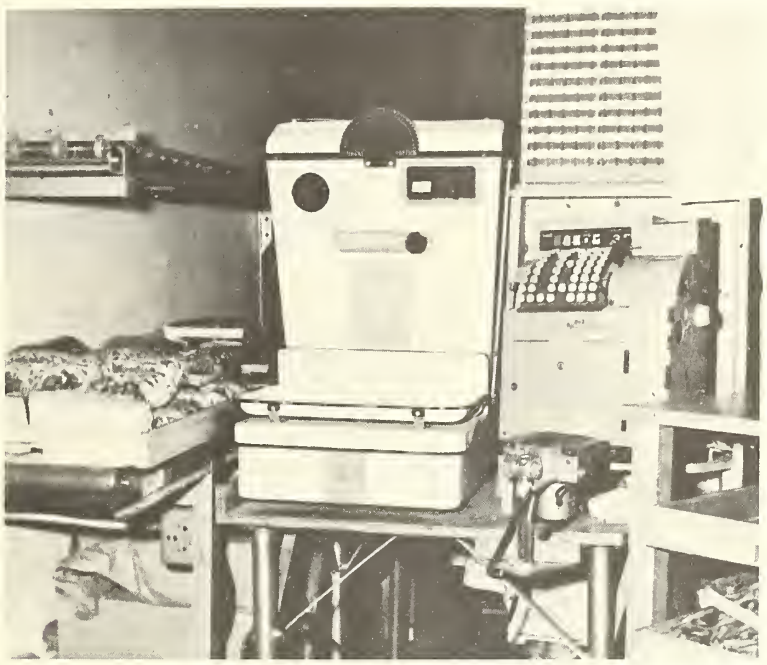
Pressure-sensitive labels for identifying the package require the least investment in equipment and supplies. The labels (24 to a sheet) generally are placed consecutively on several wrapped packages. The packages are then weighed and the weight, price per pound, and package price are written on the label (fig. 14). The labels can be blank with possibly some institutional identification, or they may have the commodity description preprinted on them.

BN-5914

Figure 14.--Writing price and weight of an item on a pressure-sensitive label.

When preprinted labels are used, a supply of the most commonly used labels is stored in racks near the scale. The operator weighs the package on a conventional prepack scale, writes on the label which is placed on a shelf in front of the scale, attaches the label to the package, and puts the package in a container.

Several methods of weighing and labeling were studied when the separate label printer and scale combination was used (fig. 15). With the outside label two methods were used to attach the label to the package--the hand iron and the label activator. The operator used both hands simultaneously to put the weight and price in the printer. When using the hand iron, the operator took the label from the printer and placed it on the package with his left hand, while his right hand obtained an unweighed package, placed it on the scale, and picked up the iron. He applied the label and disposed of the labeled package with his left hand while returning the iron to position with his right hand.



BN-5899

Figure 15.--The separate label printer and scale combination used for produce weighing and labeling and the work station designed for it.

When using the label activator, he took the printed label from the ejector slot and placed it on the activator with his right hand while taking an unweighed package and placing it on the scale, face down, with his left hand. He then picked up the weighed package with his left hand and touched it to the label, afterward patting the label with his left hand to secure it firmly. With his right hand he disposed of the package to the right.

Of the several methods of using the combined scale-printer, the one using the label activator was the cheapest for an outside label (fig. 16). With his right hand the operator obtained a label from the printer and placed it in a

slot, put the price of the package in the machine by depressing the appropriate keys, hit the motor bar, removed the printed label from the slot, and placed it on the activator. With his left hand he picked up an unweighed package, placed it on the scale, picked up the weighed package, and passed it to his right hand.

In another method studied an outside label was printed by the electronic printer-scale (fig. 17), which electronically computes the value of a package placed on it, prints the value and weight on the label, and ejects the printed label on to the label activator. The operator removed the weighed package from the scale with his right hand and touched it to the label on the activator, while obtaining an unweighed package and placing it on the scale with his left hand. Total fixed and variable costs for the labeling and weighing techniques were computed, based on weekly package volumes of 3,000, 6,000, 9,000 and 12,000 (fig. 18 and appendix, table 20). Indirect costs include depreciation on equipment, interest charges on investment, and equipment maintenance and installation. The direct costs are labels and labor.

BN-5915

Figure 16.--The combined scale-printer used for weighing and labeling produce, with activator to the right of the keyboard.

BN-5873

Figure 17.--The electronic printer-scale.

All labor costs were based on an average wage of $1.50 per hour. Since the labor cost is so large a part of the overall costs, the cost per package will vary from store to store and from region to region according to local wage rates. A retailer need only substitute his wage rate for that used in the table in order to calculate his labeling and weighing cost for the alternative methods.

For outside labels and for all 4 volumes tested, packages can be weighed and labeled by the electronic printer-scale at lower costs than by the most common method (prepack scale and preprinted thermoplastic labels on which the weight, price per pound, and selling price are handwritten). Annual savings from using the electronic printer-scale over using the preprinted labels for the 4 levels of volume are:

Packages per week	Dollars
3,000	203
6,000	1,032
9,000	1,860
12,000	2,688

Of the outside label systems tested, the only cheaper operation than the electronic scale-printer was the separate label printer and scale combination (with hand iron) at 3,000 packages per week (fig. 19). At this volume, savings of $326 per year could be achieved over the conventional operation, compared to savings of $203 for the electronic scale-printer. Although labels can be attached at lowest cost by the hand iron when a well-trained operator follows the method properly, in usual practice better acceptance and follow-through of recommended procedures and fewer burned and bruised packages were obtained with the label activator.

In several test stores a weighing station designed on the principles of motion economy and efficiency for the volume of produce was installed (fig. 15). Rules for efficiency in weighing and labeling, based on these principles, are:

1. The optimum and maximum work areas that aided in the design of the wrap tables should be considered in the weighing station.

2. All materials should be located close to and to the front of the operator.

3. Adequate accumulation space should be provided both before and after the weighing operation. The accumulation area before weighing can be a conveyor that moves wrapped merchandise from packaging tables to the scale. The accumulation area after weighing can be a dolly cart (fig. 20) where each flat, as filled with weighed merchandise, is lowered to a slot on the display dolly cart. When scale operators are women, a conveyor which will accommodate several filled flats should be used to accumulate weighed produce. The man who displays produce removes the filled flats from the conveyor to the dolly cart. 7/

4. Codes, board and tray tare values, prices, charts, and similar items should be conveniently posted where the operator can see them without leaving the weighing area.

5. Facilities for alternate sitting and standing should be provided for the operator.

6. The scale platter, label printer keyboard, label activator, and product should be approximately 38 inches above the floor.

7. The sequence of motions should provide for the maximum utilization of both hands.

7/ For detailed drawing of dolly cart see appendix, fig. 47.

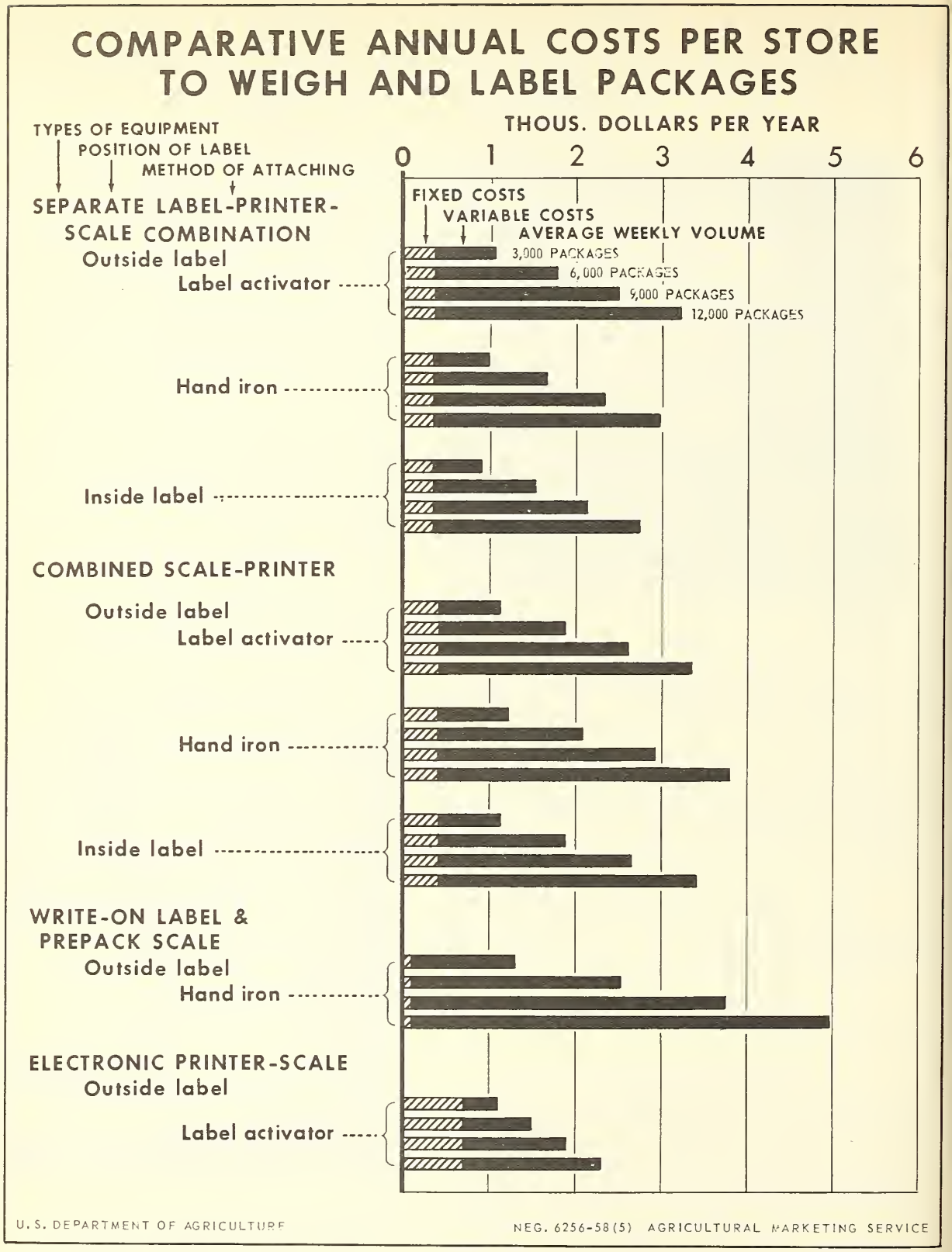

COMPARATIVE ANNUAL COSTS PER STORE
TO WEIGH AND LABEL PACKAGES
TYPES OF EQUIPMENT
POSITION OF LABEL
METHOD OF ATTACHING
THOUS. DOLLARS PER YEAR
0
1
2
3
4
5
6
FIXED COSTS
VARIABLE COSTS
AVERAGE WEEKLY VOLUME
3,000 PACKAGES
6,000 PACKAGES
9,000 PACKAGES
12,000 PACKAGES
SEPARATE LABEL-PRINTER-SCALE COMBINATION
Outside label
Label activator
Hand iron
Inside label
COMBINED SCALE-PRINTER
Outside label
Label activator
Hand iron
Inside label
WRITE-ON LABEL & PREPACK SCALE
Outside label
Hand iron
ELECTRONIC PRINTER-SCALE
Outside label
Label activator
U.S. DEPARTMENT OF AGRICULTURE
NEG. 6256-58(5) AGRICULTURAL MARKETING SERVICE

Figure 18.

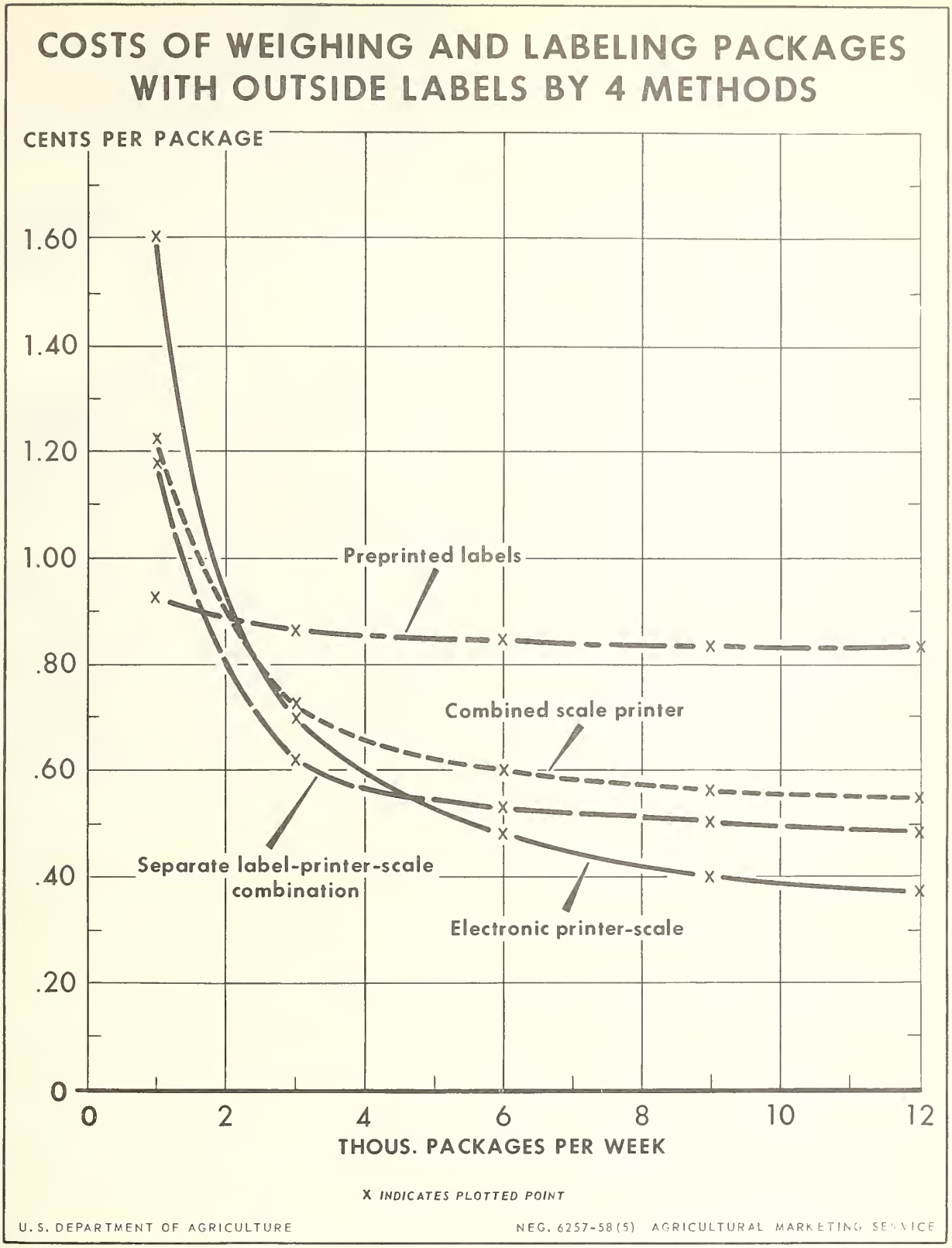

COSTS OF WEIGHING AND LABELING PACKAGES WITH OUTSIDE LABELS BY 4 METHODS
CENTS PER PACKAGE
1.60
1.40
1.20
1.00
.80
.60
.40
.20
0
Preprinted labels
Combined scale printer
Separate label-printer-scale combination
Electronic printer-scale
0
2
4
6
8
10
12
THOUS. PACKAGES PER WEEK
X INDICATES PLOTTED POINT
U.S. DEPARTMENT OF AGRICULTURE
NEG. 6257-58(5) AGRICULTURAL MARKETING SERVICE

Figure 19.

Several scale tables based on these principles were developed for the various types of equipment used. The workplace shown in figure 15 incorporates the best methods used with the separate scale and label printer combination. Produce is fed to the left of the scale by conveyor. The flat is turned as it is positioned on the 90° extension conveyor. The extension conveyor permits the operator to pull the flat forward as he obtains packages toward the back of the flat. The flat is adjacent to and at the same height as the scale platter. The label printer is to the right of the scale and is tilted backward to facilitate the ring-up operation. The label activator is directly in front of the label printer. Weighed packages are placed on the flat to the right of the label printer (a detailed drawing of this weighing station is shown in the appendix, figure 48).

BN-5905

Figure 20.--Dolly cart for transporting packaged produce to display.

PROCEDURES AND LAYOUT FOR THE PRODUCE PREPACK LINE

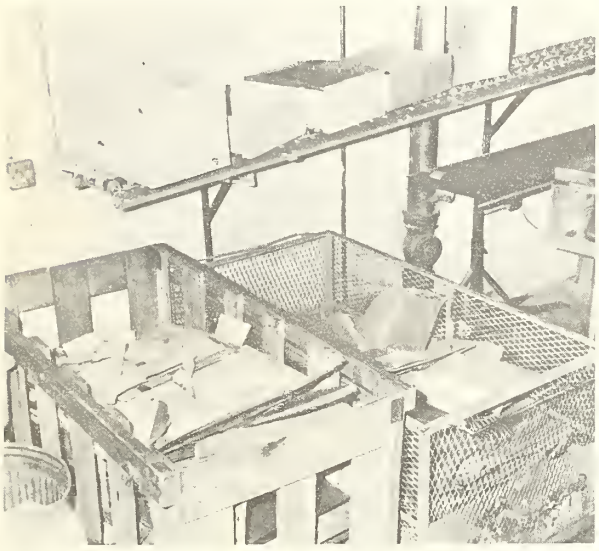
The time and manner in which certain produce items should be packaged must be considered in planning the mechanics of the packaging line operations. For example, some items, such as most vegetables and salad items, are perishable and should be packaged each day, before the morning arrangement of produce. Less perishable items and so-called produce hardware items can be packaged somewhat in advance of sale. When packaging facilities and wrappers are limited, it is sometimes necessary to alter the packaging material or method for items that are being featured. This is especially true during the summer when fresh fruits are plentiful and prices are low. To relieve the pressure on the prepack line, these items can be packaged in cellophane or polyethylene bags, paper bags with handles, or baskets with a cellophane cap.

In order to have an efficient overall prepackaging operation, procedures and layout must permit smooth integration of the several steps in the process. Such procedures and layout were developed in one of the experimental stores and were then used as a guide or model in setting up prepackaging installations in other stores. On the prepack line in the principal experimental store, each wrapping station had an inclined holding shelf which held about 3 master containers. A platform-type stocking truck was used to move produce from the cooler or storage to the line.

Before the containers were placed on the wrap station, the tops or lids were removed with either a combination hammer-box opener or with a portable,

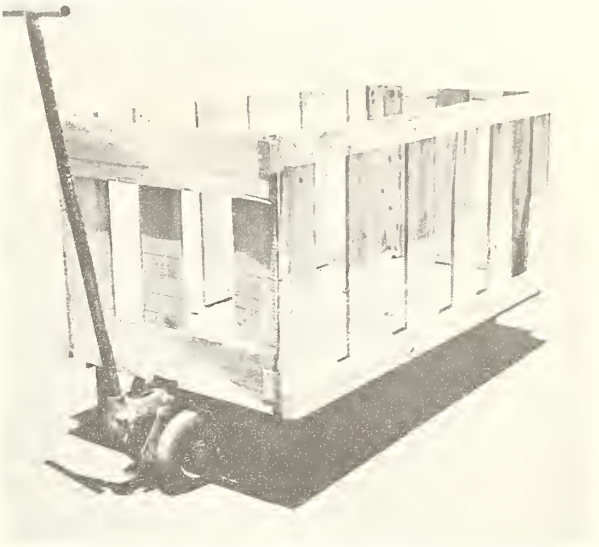
circular power saw with 6-inch blade. In the installation studied the circular saw reduced labor requirements by 50 percent and eliminated the hazard of exposed nails on opened boxes and crates. Limitations to using the circular saw are that falling sawdust clings to soft, moist items such as berries and grapes, and that the volume of sales in the store must be large to justify the cost of a saw for this use.

Empty shipping containers were placed on an overhead conveyor (fig. 21) and moved to the salvage storage area. Cardboard and wood that were not sold were broken down and placed in separate racks. These 24-inch high racks were collapsible and were placed on a 30- by 60-inch semilive skid (fig. 22). Once or twice a day the loaded racks were emptied. Wirebound containers were collapsed and placed on a skid with bushel baskets and other boxes that were sold.



BN-5870

Figure 21.--Salvage containers move by conveyor from wrap stations to salvage storage area.



BN-5872

Figure 22.--Semilive skid with collapsible rack is an effective means for handling produce salvage containers.

Empty master containers (flats) were placed on a shelf under each wrapping station by the display man when he returned from the display area. Wrapped and priced produce in flats that would not immediately go on display was placed in racks in the cooler (fig. 23). (For construction details of cooler storage rack see appendix, fig. 49.)

The most commonly used trays and backing boards were stored in a rack mounted over the film holder. Other trays were located in slots at the operator's left. Each station was provided with a stool with back and foot rest so the operator could alternately sit or stand. The conveyor which fed wrapped merchandise to the weighing station was pitched approximately 1-1/2 inches per 10 feet. The heights of the individual wrapping stations were adjustable so the full flat could be pushed from the table onto the conveyor.

Two methods of setting up back room processing facilities for a self-service produce operation are illustrated by figures 24 and 25. Before conversion the department shown in figure 24 had been a bulk produce operation and the packaging operations had to be adapted to the existing building design. In the department shown in figure 25, some adjustment in building design was permitted to adapt the arrangement of facilities for the produce packaging room. In neither layout was trimmed merchandise fed directly to the wrapping stations; of the items trimmed, only some corn and cauliflower were packaged.

BN-5928

Figure 23.--Cooler storage rack for reserve packaged produce.

In the store illustrated by figure 25 the produce work room is divided into 4 separate work centers, each performing a different function. Space is provided in each area for storage of processed and unprocessed merchandise. Unprocessed merchandise is stored on 30- by 60-inch semilive skids in this store (fig. 25) because there is no receiving dock. If a dock at truck-bed level were available, it would be more efficient to receive and store on pallets (9). The trimming work center is located along the wall near the cooler door (fig. 25). Items to be trimmed are selected in the cooler and placed on the conveyor to move by gravity toward the garbage disposal unit. Items are trimmed over the opening of the garbage disposal unit, working from left to right, except with commodities which are washed. When these are trimmed they are placed in plastic-coated wire baskets on the sink drainboard. They are then washed by spraying or by dipping the filled basket in the sink (1).

A second work center is for packaging in film wrap. The packaging area in this store (fig. 25) is against the wall opposite the cooler door. Shipping containers of merchandise to be packaged are brought from the cooler or trimming station by platform truck and placed on the sloped shelves of each packaging station so they are conveniently tilted toward the operator at his right front. The packaging operator wraps each package as soon as he fills it, in a combined wrapping and filling operation, and places the finished package in a flat on the station to his left front. When filled, the flat is pushed on the conveyor and rolls to the weighing station. Empty shipping containers are placed on a high-level conveyor on which they roll beyond the weighing station to wood and paper trash racks mounted on semilive skids (fig. 21). The weighing station operator weighs and labels each package and places it in another flat to the left of the station. This flat, when filled, is rolled down the

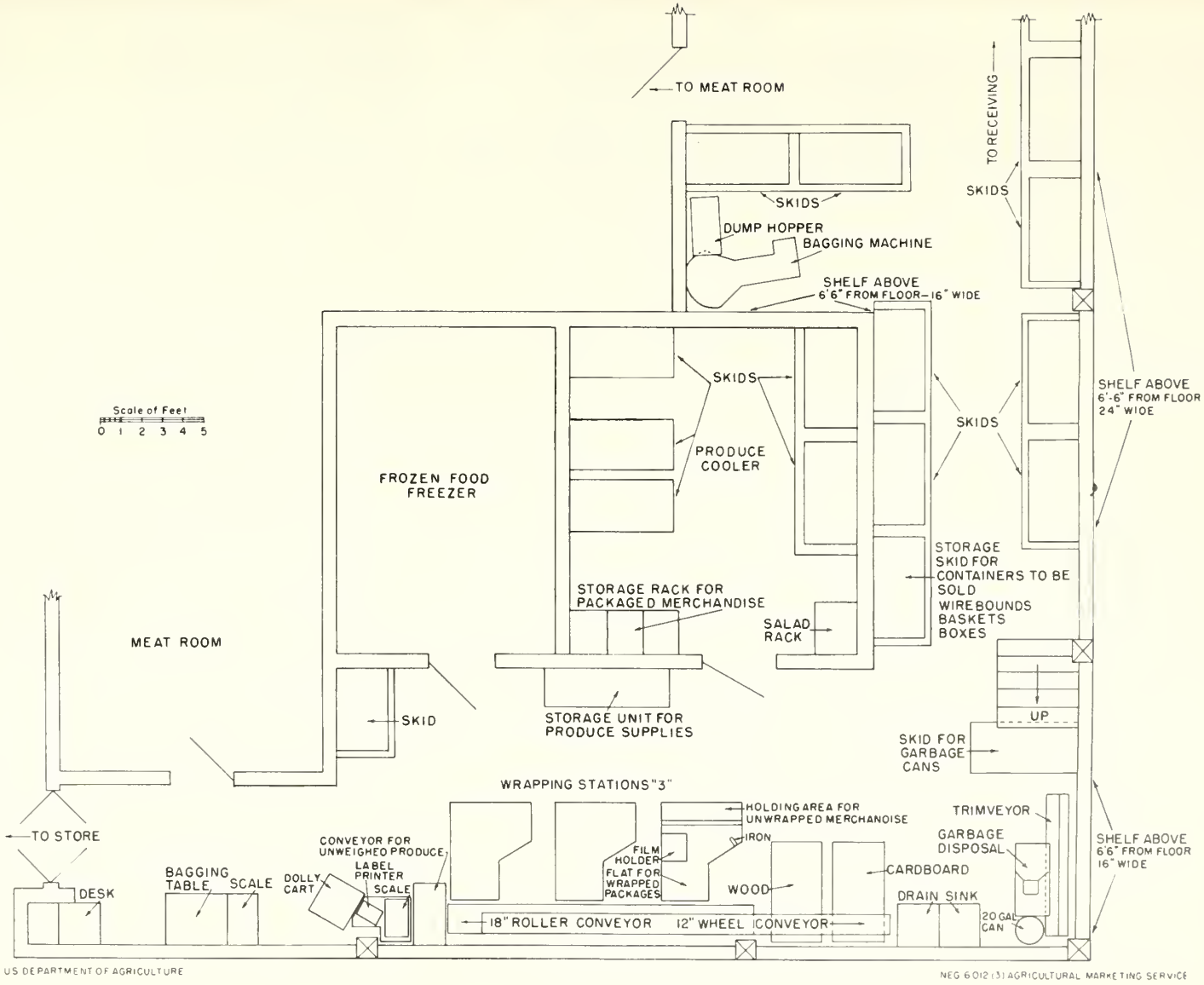


Figure 24.--A produce back room which was converted from partial self-service to complete self-service.

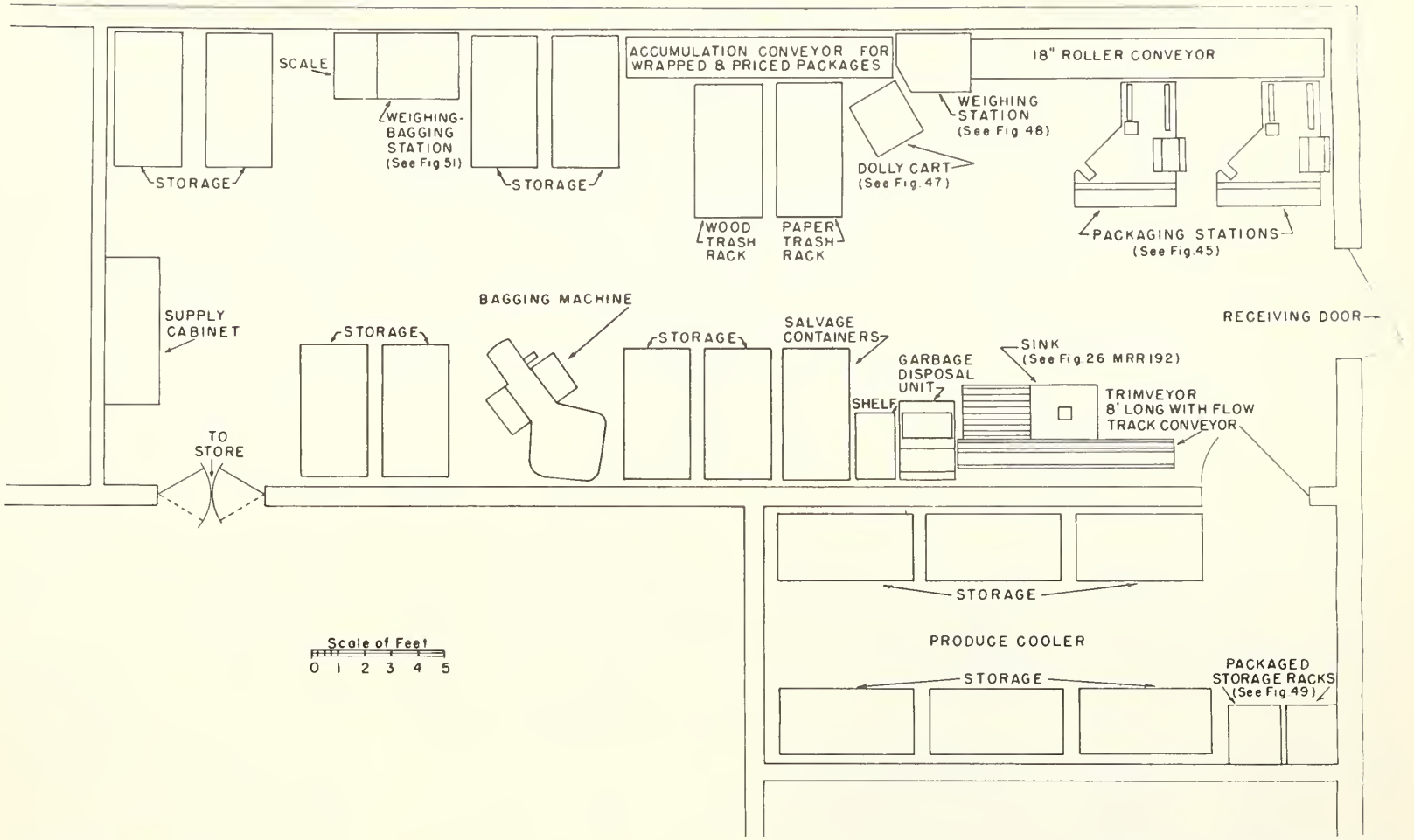


Figure 25.--Layout of a back room in a self-service produce department.

accumulation conveyor for temporary storage. The display man removes the filled flats from the accumulation conveyor to a dolly cart for movement to the sales area or to the package storage racks in the cooler.

A third distinct work center, the machine bagging area, is located along the same wall as the trimming area in this store (fig. 25). Such items as potatoes, onions, citrus, and apples are bagged in polyethylene and kraft bags in this area. To bag apples and citrus, a special hopper tray is used on the machine to avoid bruising the product. Semilive skid storage is provided on either side of the bagging machine. Tubs, which can be nested or stacked one on top of the other when full without crushing the merchandise, are used as master containers for handling the bagged merchandise. Merchandise bagged in advance is stored in these tubs on semilive skids.

The fourth major work area is the weighing-bagging station, across the room from the machine bagging area in this store (fig. 25). Items such as cabbage, rutabagas, peppers, and bananas are processed in this area. Items that cannot conveniently be machine bagged, such as 1-pound bags of onions, cherries, and plums, are bagged in this area.

This arrangement of work centers allows merchandise to move through the various stages of processing from receiving to display with a minimum of backtracking and double handling. The direction of movement of items in processing is generally from the receiving door toward the door into the store sales area. Since most wood and paper trash and salvageable shipping containers originate in the packaging and trimming work centers, specific places for accumulating each of these are convenient to these work centers yet out of the way of processing activities. Conveyors, carts, and semilive skids are used for movement of items.

BAGGING PRODUCE

If a retailer wishes to bag produce items, he can select from several alternative bag materials. Polyethylene bags are often used for such items as apples, grapefruit, and lemons; with numerous ventilation holes they can be used for oranges, onions, potatoes, and sweetpotatoes (5). They are also used for beans, peas, squash, corn, and other vegetables, and such salad items as lettuce and celery. Growers and repackers commonly use them for carrots, radishes, slaw, tossed salad, and other items. Cellophane bags are used for lettuce, celery, spinach, and other vegetables that are not too heavy. Kraft paper bags, single- or multi-walled and with or without a mesh window, have long been a standby for such items as potatoes and onions. Paper bags with handles and mesh bags are also used for potatoes.

Methods and Equipment for Polyethylene Bagging

If there is any discernible trend in produce packaging it probably is toward more polyethylene bagging. As this material becomes clearer and more durable it becomes more widely used, especially for produce hardware items. Three problems arise in packaging with polyethylene: (1) How to fill the bag; (2) how to price the bag; and (3) how to close the bag.

Methods of Filling Polyethylene Bags

Three methods of filling polyethylene bags were tested with bags of different weight and with various commodities. In the most conventional method the merchandise to be bagged was dumped on a table; the operator held the bag in one hand and filled it with the other (fig. 26). The bag was weighed and closed with pressure-sensitive tape from a dispenser.

In the second method, a funnel, developed by researchers of the U. S. Department of Agriculture, was incorporated in a packaging table. 8/ This open front funnel could accommodate bag sizes from 2 to 10 pounds. While holding the bag over the funnel the operator rolled or placed the merchandise in it with the other hand. A raised lip around the edge of the funnel where it joins the table surface prevented excess produce falling off the table when the bag was full or was being weighed (fig. 27). 9/ The filled bag was weighed and closed as in the first method.

BN-5887

Figure 26.--Hand-filling a polyethylene bag on a table.

In the final method tested, a semiautomatic bagging machine was used (fig. 28). The empty polyethylene bag was placed over the chute and the contents dumped into the bag. As the chute returned to its normal position the machine was automatically started and the approximate amount of merchandise was conveyed into the chute. Merchandise was added or removed until the correct weight was obtained. The filled bag was twisted and closed as in the first method. The time required to perform the comparable elements for the three methods is shown in table 7.

Costs for the packaging table with funnel as opposed to hand-filling methods are $1.70 less per 1,000 packages. The semiautomatic bagging machine will save $3.10 compared to the packaging table and $4.80 compared to hand-filling methods.

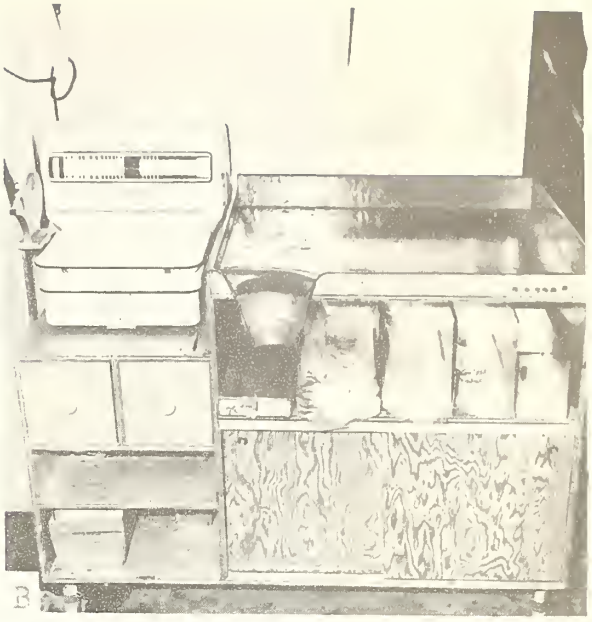
8/ For construction details of funnel see appendix, figure 50.

9/ For construction details of produce packaging and weighing table for back room see appendix, figure 51.

A

BN-5924

Note how bag adapts to chute



B

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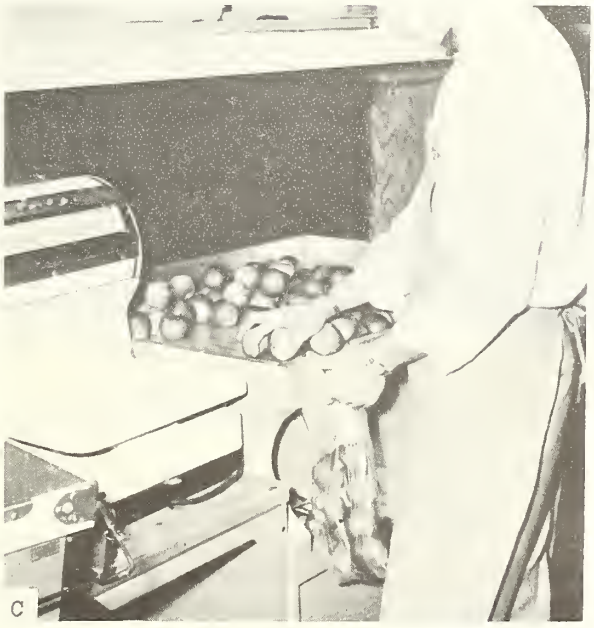
The packaging table



C

BN-5896

Filling the bag

Figure 27.--Filling a polyethylene bag at special packaging table using an open chute.

Table 7.--Comparative labor costs per package for 3 methods of filling polyethylene bags 1/

Commodity	Fill by hand: from dumped: merchandise	Fill with aid of funnel on packaging table	Semiautomatic bagging machine
	Seconds	Seconds	Seconds
Onions (3 pounds)	26.4	20.2	13.6
Apples (4 pounds)	29.5	26.2	15.7
Potatoes (5 pounds)	26.0	23.6	18.0
Average time per package	27.3	23.3	15.8
	Cents	Cents	Cents
Labor cost at 2.5 ¢ per minute	1.14	.97	.66

1/ The times reported are for the bag filling element only and do not constitute a production standard.

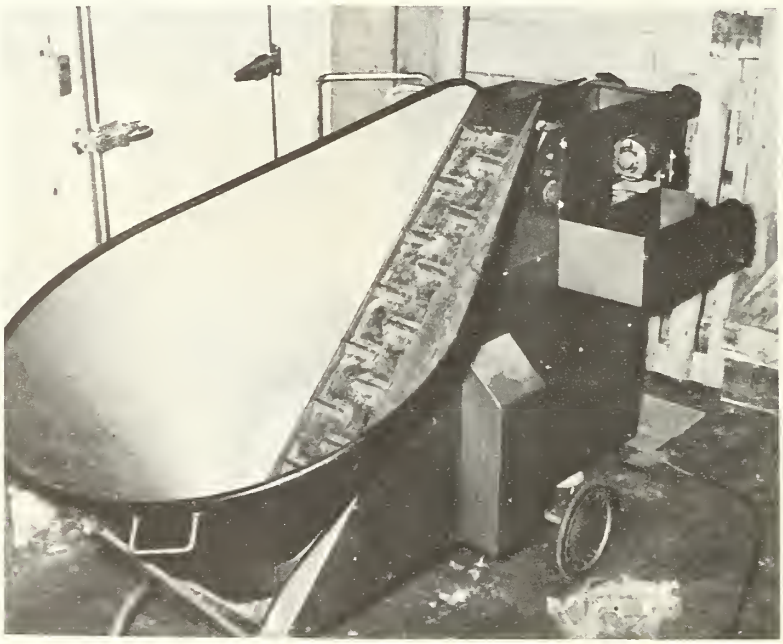


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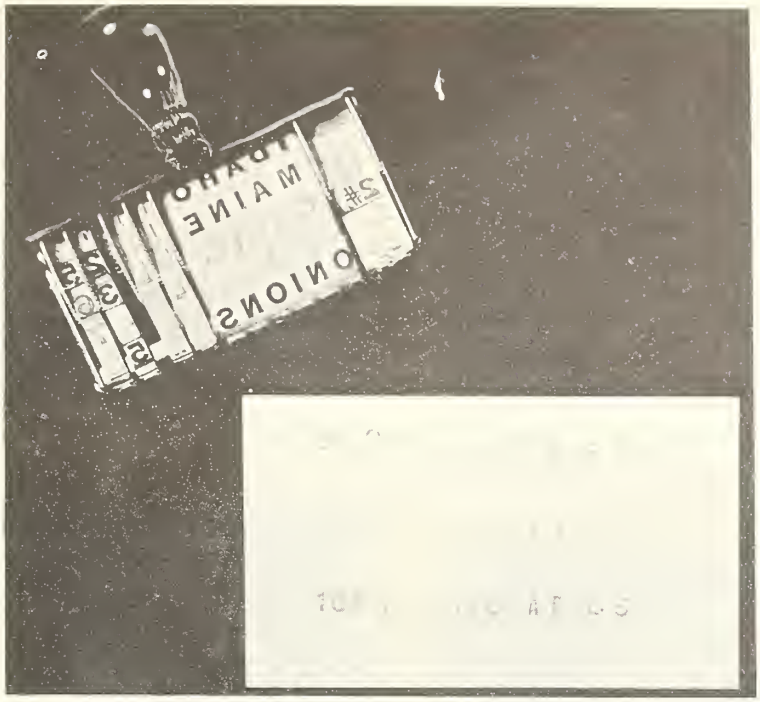
Figure 28.--A semiautomatic bagging machine.

Methods of Weighing and Labeling Polyethylene Bags

Most polyethylene bags in retail stores are partially printed and have a spot for pricing and identifying the package. The pricing problem will differ according to whether the package is unit priced or unit weighed. If the package is unit priced the bags can be stamped with commodity identification, weight, price, and code if necessary, before the bags are filled. Although the conventional stamp may have bands for both price and code, the operator will still have to write in the weight and possibly the commodity identification. Stamps are available (fig. 29) which will place all the desired information on one impression. Self-inking stamps are available which stamp all the information



BN-5913

Figure 29.--Multiband adjustable stamp for marking weight, commodity, code, and price on packaged produce.

except the code in one impression. Depending on the information required on the bag, the saving per 1,000 bags through use of the multiband stamp is $1.90 when the operator must write in code and weight, $2.80 when the operator must write in commodity, type, and weight, and $4.20 when code, commodity type, and weight must be written on the bag (table 8).

Table 8.--Comparison of labor costs for placing the price, code, weight, and commodity identification on polyethylene bags when they are unit-priced 1/

Item	Stamp price, stamp weight, write in code	Stamp price and code, stamp weight, write in: commodity type	Stamp price, stamp weight, write in code, write in commodity type
	Seconds	Seconds	Seconds
Conventional method	6.8	8.9	12.3
Improved method, stamp only	2.3	2.3	2.3
Savings in seconds per package	4.5	6.6	10.0
Savings per package at 2.5¢ per minute	.19¢	.28¢	.42¢
Savings in labor per 1,000 packages	$1.90	$2.80	$4.20

1/ Assuming a wage rate of 2.5¢ per minute.

When the polyethylene bags are individually weighed, any of the methods of weighing and labeling described in the section on weighing and overwrapping produce can be used. With a volume of 3,000 packages per week, the cost of labor and materials is 0.86 cent per package for a pressure-sensitive label and 0.67 cent for the separate label printer-scale combination with the label activator. 10/ If the operator writes price, price per pound, weight, and commodity type on the bag, the cost per bag is 0.90 cent. Because of the difficulty of writing on an irregular surface readability often is sacrificed. Another common method is the use of the wire-enclosed paper tie with flag for the required information. The cost of labor and label (0.14 cent each) for this operation is 0.82 cent. The same disadvantages exist as for the handwritten label.

The costs of labor and materials for alternative methods of pricing and identifying polyethylene bags when they are individually weighed and priced are:

	Cent
Separate label printer and scale combination.	0.67
Pressure-sensitive label.....	.86
Write information on bag with ball point pen (using no label but higher priced printed bag).....	.90
Wire-enclosed paper tie with information flag	.82

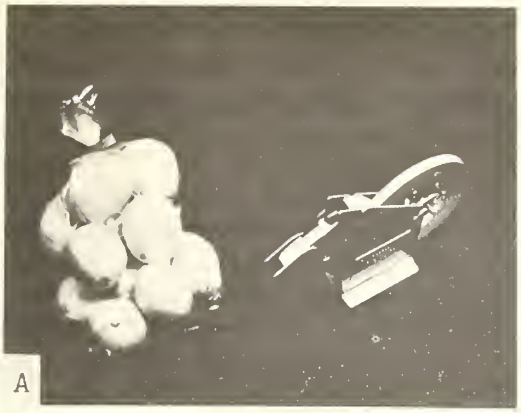
Savings through use of the separate label printer and scale combination as compared to the pressure-sensitive label are $1.90 per 1,000 packages.

Methods of Closing Polyethylene Bags

Generally, the sole function of the devices used to close transparent film-type bags is to seal in the contents. However, some types of closing devices also are used for price-marking the bagged unit. Since most bags are now printed with a spot for the weight and price, there is little advantage to be gained from using the closure for the price mark. In each of 6 bag-closing methods studied, the operation consisted of (1) twisting (or folding) the neck of the bag, (2) affixing the closing device, and (3) placing the filled bag in a master container (fig. 30).

In one method a pressure-sensitive tape in a dispenser was used and two steps were involved: The twisted neck of the bag was positioned on the tape and depressed into the jaw of the machine which sealed the tape about the neck; the bag was then removed from the jaw, and the tape was cut off on a V-type blade. This machine dispenses tape either 1/2-inch or 3/8-inch wide.

10/ For additional details see appendix, table 20.



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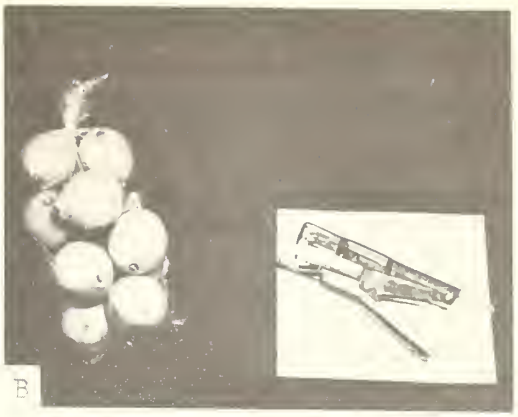

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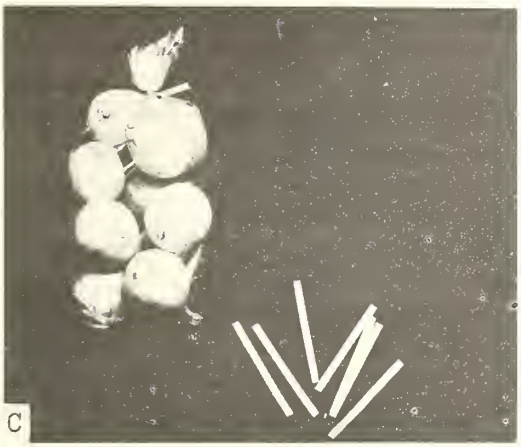

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Figure 30.--Some methods of closing polyethylene bags: (a) Pressure-sensitive tape; (b) jaw-type hand stapler; (c) wire-enclosed paper tape; (d) metal clip; (e) plastic tag; and (f) saddle price tag and conventional stapler.

The dispenser is also effectively used for placing a 1/2-inch band of tape around bananas. 11/

In the second method the twisted neck of the bag was inserted in the jaw of a jaw-type hand stapler and a staple placed around the bag.

Third, the neck of the bag was twisted and closed by a wire-enclosed tape which was wrapped around the bag and twisted tight. The ends of the tape were then bent back. The tape is either plastic or paper (in different lengths) with a wire imbedded in the material. In this study 4-inch plastic and approximately 5-inch paper tapes were used. There was no appreciable difference in time requirements. (The material costs in table 9 are based on paper tapes.)

Table 9.--Cost of labor and materials per bag for 6 types of closures for polyethylene bags

Types of closures	Costs		
	Labor at $1.50 per hour	Materials 1/	Total
	Cents	Cents	Cents
A. Pressure-sensitive tape (3/8 in.) with dispenser	0.260	0.051	0.311
B. Staple with jaw-type stapler	.310	.047	.357
C. Wire-enclosed tape	.357	.079	.436
D. Metal clip	.292	.200	.492
E. Plastic clip	.312	.197	.509
F. Staple and saddle tag	.687	.017	.704

1/ Basis of material costs:
A. $0.44 per 60 yards (in 3,300-roll lots) and 2-1/2 inches per bag.
B. $2.36 per 5,000 boxes in 80-box lots.
C. $15.75 per 20,000 pieces 5 inches long.
D. $2.00 per 1,000 in 100,000 lots.
E. $1.97 per 1,000,000 lots.
F. $0.43 per 5,000 in quantity lots--2 per bag.

In another method a small metal clip was placed around the twisted neck of the bag and compressed tight by the thumb and forefinger.

In still another method a plastic tag approximately 3/4 by 1-1/4 inches with a slotted opening was snapped on the twisted neck of the bag. This tag is large enough that the package price can be stamped or written on it.

11/ Limited studies were made of a semiautomatic dispenser which sealed the bag in one operation. As with the first method the bag was first twisted but rather than cutting the tape by removing the bag from the jaw of the dispenser it was cut when the twisted neck was further depressed in a continuous motion and the sealed neck pulled out at the bottom of the jaw. Since the time to pick up bag and twist its neck and time to place the bag in the master container constitute most of the closing time and are not controlled by the type of sealing device, the saving of 2 minutes per 1,000 bags is relatively small.

In the last method the top of the bag was folded over and a 2- by 4-inch saddle price tag was placed over the fold and attached with a conventional desk or hand stapler. The price tag identifies the commodity, its weight, code, and price.

There is little difference in the labor requirements for all methods other than the last one (table 9). The size of the bag or the length of the neck has a greater effect on labor requirements than the type of closure. In several tests in which undersize bags were used, from 40 to 58 percent more labor was required to twist, close, and dispose of the bag than when the proper size bag was used (approximately 2 inches of bag above the closure). Furthermore, when the neck of the bag is too short, the chances of the closure coming loose are increased.

Methods and Equipment for Cellophane Bag Packaging

Motion and time studies were made to determine the cheapest method of packaging 3 of the produce items most commonly packaged in cellophane bags at stores. These items were spinach, green beans, and lettuce. 12/ Many of the techniques previously discussed for the polyethylene bagging of produce will also apply to cellophane bagging, especially when the item can alternatively be bagged in either polyethylene or cellophane.

Spinach and green beans were packaged in cellophane bags and in overwrapped trays (either No. 2 or 9-1/4 by 6-1/4 by 2-1/2-inch deep-dish tray). A funnel was used to facilitate the bag filling operation. In these tests the filled bags were closed with 2 staples, but in a volume operation a jaw-type heat-sealing device would give a neater package with less labor. A comparison of costs of labor and materials reveals that the cellophane bag costs 2.00 cents less for spinach and 0.72 cent less for beans than the cellophane overwrapped tray package (table 10).

Methods and Equipment for Bagging Potatoes and Onions in Kraft-Type Bags

Hand filling and weighing the bag at a table in the back room was one of the simplest and most common methods of packaging encountered. In this particular study potatoes and onions were dumped on a 3- by 6-foot rimmed, metal-lined table (fig. 31). (For construction details of potato and onion bagging table see appendix, fig. 52.) Both hands were used to fill the bag after there was sufficient weight in the bottom to hold the mouth of the bag open. When the bag was filled to the approximate desired weight it was weighed on a scale located on the table and its weight adjusted by adding or subtracting units. The bag was removed to the table where it was closed, stapled, and placed on a platform-type stocking truck. A definite workplace was provided for the scale and tools.

12/ An analysis of the packaging of lettuce in cellophane bags appears in the section on preparation of lettuce for sale.

Table 10.--Labor and materials costs for packaging spinach and beans in cellophane bags and in overwrapped packages (regular elements only)

Element	Spinach		Beans, stringless	
	Cellophane bag	Overwrap	Cellophane bag	Overwrap
	Seconds	Seconds	Seconds	Seconds
Position bag on funnel	6.9		6.9	
Fill bag or tray	30.5	51.5	11.8	25.5
Close cellophane bag and dispose	17.8	--	10.4	--
Position merchandise in empty tray	--	4.9	--	3.0
Seal A and B	--	10.4	--	6.2
Seal C	--	10.9	--	8.2
Seal D	--	10.1	--	8.6
Put package away	--	3.5	--	2.5
Obtain film	--	4.9	--	3.4
Total time per package	55.2	96.2	29.1	57.4
	Cents	Cents	Cents	Cents
Labor cost at 2.5¢ per minute	2.30	4.01	1.21	2.39
Cellophane bag 450 gage (4-1/2x3-1/2x13) cost	2.08	--	2.08	--
Film costs	--	0.96	--	0.85
Tray cost	--	1.41	--	0.77
Total labor and materials costs per package	4.38	6.38	3.29	4.01

BN-5925

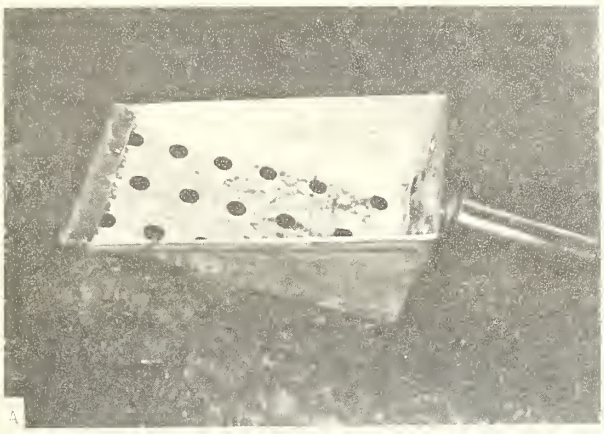
Filling the bag

BN-5869

Balancing scale to desired weight

Figure 31.--A typical method of bagging potatoes.

In the second method a bagging table designed by personnel of the U. S. Department of Agriculture was used, but the bag was filled with a lightweight aluminum scoop instead of by hand. This hand scoop, developed by USDA researchers, had a capacity of approximately 5 pounds (fig. 32). An over-under fan-type scale was used on which a 3-sided well was substituted for the usual scale scoop. (For construction details of bagging well and mounting see appendix, fig. 53.) The empty bag was selected from an inclined bag shelf adjacent to and on the same level as the 3-sided bagging well, and positioned in the well (fig. 32). Two full scoops or 3 partially filled scoops approximated a 10-pound bag. The use of 2 full scoops required the least time to fill the bag. The operator then added or removed potatoes to obtain the desired weight.



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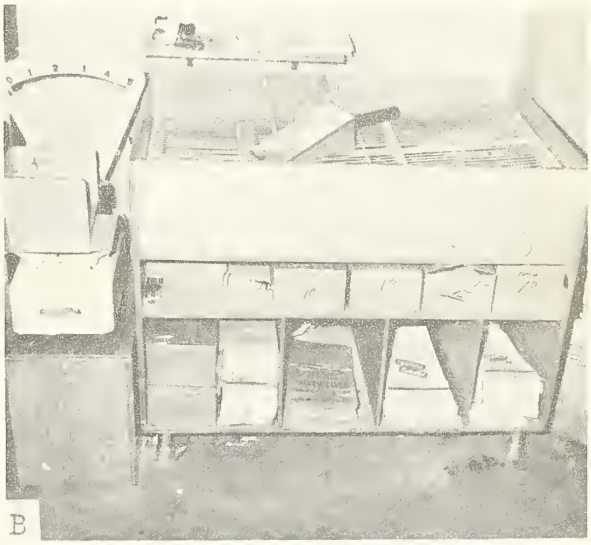

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Figure 32.--Use of the hand scoop and modified scale well: (a) The hand scoop; (b) the bagging table; and (c) filling a 10-pound bag from the bagging table.

When putting potatoes in 5-pound bags one full scoop of potatoes was placed in the bag and the balance added by hand, if necessary. One partially filled scoop of onions weighed about 3 pounds. 13/ For construction details of potato scoop see appendix, fig. 54.) Each bag was closed and stapled in the well, and then placed on the platform-type stocking truck. The workplace

13/ A smaller scoop was designed for packaging onions because the regular scoop was almost too large to go in the mouth of a 3-pound onion bag.

arrangement positions the top of the bag in the well at a convenient height for the average operator. The clipper-type stapler was suspended by elastic cord over the filled bag to facilitate stapling.

A semiautomatic bagging machine was used in the third method tested. The produce was dumped into a hopper with 300 pounds capacity. It was then elevated and dropped into a bag held in place on the paper bag attachment which was connected to the over-under scale mechanism. Various attachments for the machine made possible the packaging of a variety of produce items in sizes from 2 to 10 pounds in paper, polyethylene, or mesh bags. During the test the operation was modified as follows:

1. A shelf was attached to the hopper to facilitate the dumping of the produce into the hopper. The 50- or 100-pound bag was placed on the shelf and then opened. Since the shelf was slightly inclined toward the hopper, some of the product rolled into the hopper by gravity. This made it easier for the employee to dump the heavy bags.

2. The storage shelf for empty bags was altered to place the bags directly to the right and on the same plane as the bag holder or the chute, depending upon which attachment is used.

3. An adjustable bag support platform on the paper-bag holder prevented tearing the bag when successive large potatoes rolled into it.

4. A stool was designed which had an adjustable shelf on which the filled kraft bags were stapled.

The most productive method of bagging in kraft-type bags with this machine resulted from the use of the attachment to hold paper bags. The empty bag was attached to the bag holder and the machine was started in one motion. The bag, which previously had been filled and balanced for the correct weight, was resting between the operator's legs on the adjustable shelf. While the empty bag was being filled, the operator closed, stapled, and placed the full bag on a platform truck at his left. The next bag was then balanced, removed, and placed on the shelf and an empty bag was placed in the bag holder. A controlled tilted bagging head used in conjunction with a special tray attachment enabled the operator to bag apples and other tender produce (8).

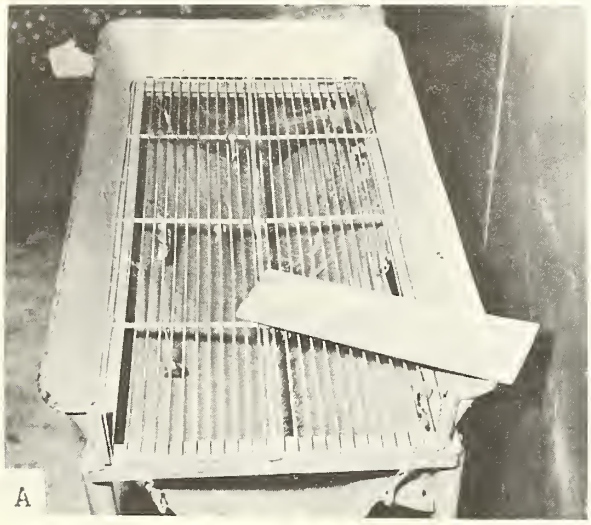
The semiautomatic bagging machine was the most efficient method of bagging potatoes and onions at the retail store. Compared with conventional hand filling methods, it was 60 percent more productive for bagging 3 pounds of onions, 59 percent more productive for 5 pounds of potatoes, and 89 percent more productive for 10 pounds of potatoes (table 11). The semiautomatic machine was 14 percent more productive than the most efficient hand method (hand scoop--with bag placed in scale well) for 3 pounds of onions, 39 percent more productive for 5 pounds of potatoes, and 45 percent more productive for 10 pounds of potatoes. This and other similar bagging machines were equally effective for bagging oranges, grapefruit, and apples, provided steps were taken to prevent bruising.

Table 11.--Number of bags filled per man-hour for bagging 3 pounds of onions, 5 pounds of potatoes, and 10 pounds of potatoes in kraft-type bags by 3 methods 1/

Method	3 pounds of onions	5 pounds of potatoes	10 pounds of potatoes
	Bags	Bags	Bags
Hand filling at table in back room	91	90	65
Filling with small scoop in bag well	128	103	85
Semiautomatic machine	146	143	123

1/ See appendix, table 21 for a production standard which illustrates the details involved.

A dump table was designed to be used in conjunction with the bagging machine. In the bottom of the table was a wire rack which allowed dirt and onion skins to fall through and onto a drop cloth (fig. 33). This dump table reduced time to peel onions from 12.9 minutes to 9.3 minutes per 50-pound bag, a decrease of 28 percent. 14/ The table was also useful for sorting potatoes when they were merchandised into 2 price categories. One lot was graded out and placed in the dump hopper of the machine. After the lot was bagged the gate was removed and the second lot of potatoes rolled into the dump hopper.



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Details of top

BN-5879

Table in position by bagging machine

Figure 33.--A dump and sorting table used in conjunction with the semiautomatic bagging machine.

14/ For construction details of the dump table see appendix, figure 55.

Methods of Weighing and Pricing Bagged Produce

Where bagged produce is sold by weight the operator has a choice of several methods of pricing the bag. For example, in pricing 3-pound bags of apples the following alternatives are possible: (1) Count the number of apples required to slightly exceed 3 pounds; (2) weigh each bag at 3 pounds with allowance for shrinkage; or (3) pack to approximately 3 pounds and weigh to nearest ounce. Studies were made in 5 stores to determine labor, materials, and excess product costs for the various pricing techniques.

Excess product costs arise from putting more than the required amount in the package. However, problems also arise from putting less than the required weight in the package. On the assumption that an error in either direction is equally undesirable, table 12 shows the average error per bag as the overweight plus the underweight divided by the number of bags weighed.

Table 12.--Comparative weight errors resulting from 3 methods of pricing bagged apples in 3 stores

Item	Method A-- count number of apples per bag	Method B-- count number of apples per bag and weigh bag	Method D-- fill bag on machine to about 3 pounds
	Number	Number	Number
Bags weighed	50	30	67
Bags over 3 pounds	28	25	47
Bags under 3 pounds	9	0	7
Bags exactly 3 pounds	13	5	11
	Pounds	Pounds	Pounds
Average error per bag	0.1	0.1	0.07
Average overweight per bag	0.07	0.1	0.05

In one store (method A) 13 size 163 or 12 size 150 apples were placed in each bag. Occasionally, while the bags were being filled, one was check-weighed to insure that it contained 3 pounds. Each bag was filled and sealed with a wire-enclosed paper tie with a price flag on which the commodity and weight were written, and the package was price-stamped. A sample of the bags was weighed. In none of the studies did store personnel know in advance that the apples would be weighed.

In the second store (method B) the bags were filled in the same manner as in method A, but each bag was then weighed to insure that it contained a minimum of 3 pounds and the contents adjusted accordingly. The bags were filled and closed as in the first store.

In the third store (method C) the bags were weighed to insure a minimum of 3 pounds. The exact weight and price was written on the flag-type, wire-enclosed paper tie.

In the fourth store (method D) the bags were filled on a bagging machine. A maximum tolerance of 2 ounces overweight per bag was allowed. The bags were closed with a flag wire-enclosed paper tie on which "3# Winesap 69¢" was written.

In the fifth and last method (method E) the bags were filled to approximately 3 pounds on a bagging machine. They were then weighed and priced on a label printer-scale combination. The label, which was attached to the bag, bore the following information: Price per pound, price per package, weight, commodity identification, and date code.

There were no overweight or underweight bags when methods C and E were used, since each bag was priced individually in accordance with its exact weight. The average error per bag and the average overweight per bag resulting when methods A, B, and D were used in the stores are shown in table 12.

Up to 33 cents per box of 150 or 163 apples can be saved by individually pricing the contents of each bag (table 13). Retailers agree that underweight bags of produce should not be sold, hence, the pricing techniques selected should eliminate underweights. As the price per pound increases accurate pricing becomes more important.

Table 13.--Comparative costs of labor, materials, and excess product for 5 methods of packaging 3 pounds of apples in polyethylene bags

Element	Method A--count number of apples per bag	Method B--count number apples per bag and weigh	Method C--catch weigh bag 1/	Method D--fill on machine to about 3 pounds	Method E--catch weigh on machine 1/
	Seconds	Seconds	Seconds	Seconds	Seconds
Filling and closing	16.1	17.4	16.1	13.2	11.9
Pricing	4.8	8.8	11.8	4.8	8.6
Miscellaneous elements	8.9	7.7	7.7	7.7	7.7
Total time per bag	29.8	33.9	35.6	25.7	28.2
15 percent personal and fatigue	4.5	5.1	5.3	3.9	4.2
Standard time per bag	34.3	39.0	40.9	29.6	32.4
	Cents	Cents	Cents	Cents	Cents
Labor cost at $1.50 per hour	1.43	1.62	1.70	1.23	1.35
Bag, closing device, and label	.95	.95	.95	1.16	.91
Cost of overweight merchandise at 23¢ per pound	1.61	2.30	--	1.15	--
Total cost per bag	3.99	4.87	2.65	3.54	2.26
Total cost per box of apples at 12.5 bags per box	50	61	33	44	28

1/ Catch-weighed bags are filled to approximately 3 pounds and then weighed and priced in accordance with their exact weights.

The additional labor required to insure correct weights is more than compensated by the decreased loss of produce. Comparing method A (count number of apples per bag) and method C (catch weigh each bag), labor costs are 0.27 cent higher for C but product loss is 1.61 cents higher for A.

PRICING OR CODING PRODUCE NOT PACKAGED

Many items in the produce department can be sold on a self-service basis without being packaged. Such items as bananas, citrus, melons, lettuce, salad greens, celery, corn, cabbage, cucumbers, avocados, pineapple, and eggplant, which accounted for 54 percent of produce units sold in 50 stores in which sales data were studied, can be priced individually or by groups. 15/ If other, slower-moving produce items which can be unit-priced or coded are added, the total becomes 3 or 4 percent greater. Pricing can be at the checkout counter from a price chart for most of the items except bananas, if all items which require prepricing are marked and items that need identification as to size or quality are coded prior to sale. Since the average cashier is unable to distinguish between a size 176 and a size 200 orange or between 25-cent and 29-cent lettuce, produce department personnel must price-mark or code-mark the items before they are sold.

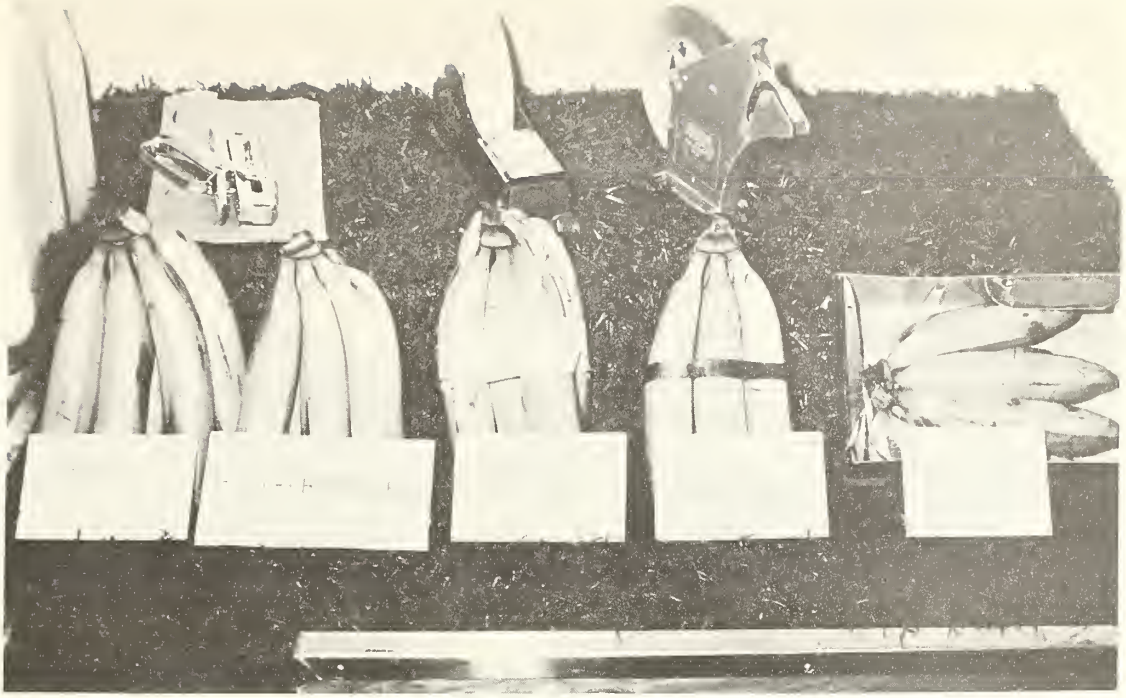
Pricing Bananas

Of the items which need not be packaged to be sold by self-service, bananas (representing approximately 8 percent of produce volume) are the principal item sold by weight (appendix, table 22). Studies were made which analyzed 7 methods of preparing bananas for sale at retail in terms of their effects upon costs of labor, materials, and shrinkage due to damage to the product by customers and employees. Limited studies were made to analyze 2 of the 7 methods in terms of their effects upon sales volume.

The 7 methods are as follows: (1) The hands of bananas are broken into customer-size bunches and placed on display. Customers select bunches and take them to the customer service scale to be bagged, weighed, and price-marked. For convenience, this method is called bulk. (2) The second method consists of breaking the hands into bunches, weighing them, and writing the price and number of bananas on each bunch. It is called the bulk-preprice method. (3) The third method is similar to the second except that a band of gummed tape, made of 60-pound bleached kraft paper, 1 inch wide, is wrapped around each bunch to hold the bananas together. This is the banded-kraft method. (4) The banded-crepe method is identical with the third except that pressure-sensitive, crepe-backed paper tape, 1/2 inch wide, is used. (5) In the fifth method bananas are bought by the store already packaged in 2 sizes of trays overwrapped with cellophane. The packages are weighed and price-marked in the store. For reference, this method is called cellophane-tray. (6) A 2-inch-wide foam rubber band is stretched over the bunch. (7) A 3-1/2-inch-wide strip of rubber hydrochloride film is sealed around the bunch in the low-heat film band method. Bunches prepared by 5 of these methods are illustrated in figure 34.

The banded-crepe and bulk-prepriced methods were studied to determine their effect upon sales. The test was designed to measure changes in sales volume resulting from substitution of banded crepe for bulk-prepricing.

15/ For details of item movement in 50 stores see appendix, table 22.



BN-5874

Figure 34.--Banana bunches prepared for sale by 5 methods.

Comparison of Costs for Unitizing Bananas

Costs of labor and materials comprise the direct costs of preparation. The direct labor costs of each of the operations, using the best work methods, workplace arrangements, and equipment known to the researchers, were measured. Costs of materials were determined by measuring amounts of materials used and multiplying by the purchase price for each method in which materials were used.

The third important item of expense in handling bananas at retail is shrinkage due to spoilage. While shrinkage before the bananas are displayed is not affected by the method of preparation used in the retail store, shrinkage during display is materially affected by the method of preparation.

The costs of preparing bananas by the 7 methods are summarized in table 14. The lowest processing cost is that for the banded-kraft method because no weighing and price-marking at the customer service scale are required, and net shrinkage and cost of materials are relatively low. A detailed comparison of 5 of these methods with explanations of the methods and reasons for the difference has been published in a previous report (10). However, such details have not been presented for the plastic-band and the low-heat film band methods. These details for the plastic-band method are similar in most respects to those already published for the banded methods, except that cost of materials for the plastic-band method is $4.54 per 1,000 pounds of bananas compared with $2.51 for banded crepe and $0.68 for banded kraft. While the cost of materials for the low-heat film band method was $1.51 compared with $2.51 for banded crepe, the cost of labor for preparation was $6.81 compared with $4.78 for banded crepe per 1,000 pounds of bananas handled.

Table 14.--Comparison of total costs of 7 different methods of preparing 1,000 pounds of bananas for display 1/

Cost element	Bulk	Bulk preprice	Banded kraft	Banded crepe	Cello-phane tray	Plastic band	Low-heat film band
	Dollars	Dollars	Dollars	Dollars	Dollars	Dollars	Dollars
Direct labor 2/	11.57	5.00	4.82	4.78	3/ 2.98	4.86	6.81
Materials cost	1.36	.25	.68	2.51	4/ .02	4.54	1.51
Added purchase cost of packaged bananas	0	0	0	0	5/15.65	0	0
Net shrinkage 6/	4.65	4.65	3.20	3.20	.33	3.20	3.20
Total	17.58	9.90	8.70	10.49	18.98	12.60	11.52

1/ Figures are computed on the basis of 963 pounds of bananas by the cellophane-tray method since shrinkage before display occurs before the bananas reach the retail store.

2/ Costs are based on a wage rate of $1.50 per man-hour.

3/ This is not directly comparable with the other labor cost figures since much of the labor of preparation is included in the premium cost of the packaged bananas.

4/ This is for materials used in sale of markdowns only, since other package costs are included in purchase cost of bananas.

5/ This is the difference between 1,000 pounds at 9.75 cents ($97.50) and 963 pounds at 11.75 cents ($113.15).

6/ This is based on a retail price of 13 cents per pound, markup on retail of 25 percent and a premium of 2 cents per pound on purchase cost of bananas packaged in cellophane trays. It is determined by the value of bananas culled out at the regular retail price minus the value reclaimed by sale of markdowns.

A new procedure for preparing bananas has been developed by which a band of cellophane about 2 to 2-1/2 inches wide is wrapped around the bananas and heat-sealed to hold them together. An obvious problem is that of heat-sealing the band of cellophane without damaging the bananas. A tool called the "perishable products cellophane bander" has been developed by which the heat seal can be made without damage to the fruit (fig. 35). 16/ Although evaluation of the cellophane bander has not been completed, savings in cost of labor and materials and other advantages appear to be offered by it.

Comparison of Sales by Two Methods

A test was conducted in one test store and 3 control stores to determine the effect on sales when the banded-crepe method was substituted for the bulk-preprice method. It was calculated that the banded-crepe method in this experiment increased banana sales by 14 percent over the bulk-preprice method.

16/ The U. S. Department of Agriculture has applied for a public patent on the cellophane bander.

BN-5901

Figure 35.--Perishable products cellophane bander and some products banded by it.

Comparison of Returns from Three Methods

The data in table 15 were to compare results, after the effect upon sales has been considered, of the 3 methods with the lowest handling costs. Data in the table were based upon sales resulting from receipt of 1,000 pounds of bananas in a store using the bulk-preprice method. The calculated 14 percent increase in banana sales is then reflected in the data pertaining to banded crepe. Since no information is available on the effect of banded kraft upon sales, the results for that method are shown both for the assumption that banded kraft will bring no change in sales compared to bulk-prepricing and for the assumption that banded kraft will result in a 14 percent increase in sales. The amount of gross margin minus costs of labor and materials is highest for banded kraft when a 14 percent increase in sales is assumed. It is lowest for the bulk-preprice method.

Price-Coding Citrus

Grapefruit and oranges, which represent approximately 16 percent of the produce volume in some areas (appendix, table 21), are among items that require price-marking if they are to be sold as units from bulk displays (2). During the citrus season, a store commonly stocks 2 or 3 sizes of oranges of different types. Unless they are individually marked, cashiers cannot be expected to correctly identify and price them. The mark or code may be in the form of lines or crosses, or may be alphabetical or numerical.

A typical price-coding operation studied was as follows: One or more crates of citrus were loaded on a stocking truck and moved to the display area.

Table 15.--Effect of banded-crepe and banded-kraft methods on net sales and operating results, compared with effect of bulk-preprice method for 1,000 pounds of bananas bought by the store 1/

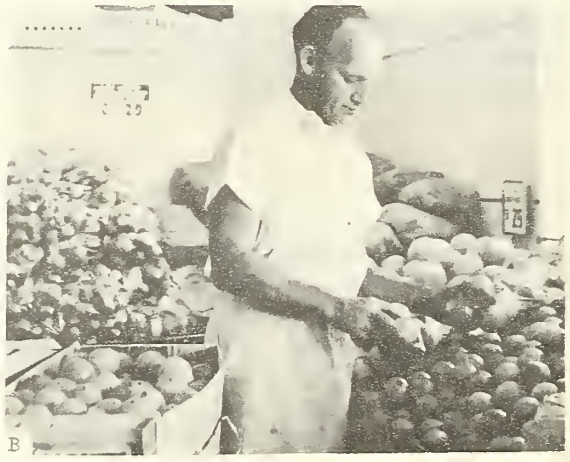
Item	Bulk-prepriced	Banded-crepe (reflecting 14% sales increase)	Banded-kraft	
			Assuming no changes in sales	Assuming 14% sales increase
	Dollars	Dollars	Dollars	Dollars
Net sales	123.64	140.95	123.64	140.95
Cost of stock 2/	97.50	109.44	96.00	109.44
Gross margin	26.14	31.51	27.64	31.51
Direct labor and materials cost	5.25	8.20	5.42	6.18
Gross margin minus labor and materials costs	20.89	23.31	22.22	25.33

1/ Data are based on retail price of 13 cents per pound and markup of 25 percent of selling price. Data are as published in AMS-149 (10) except that a wage rate of $1.50 per hour is used instead of $1.20 per hour.

2/ Losses from shrinkage are included in net sales and cost of stock since net sales represent sales at regular price and at markdown price, and cost of stock includes cost of all bananas received.

Each row in the crate was then marked with a crayon or grease pencil, an adjustable stamp, or a multi-impression, porous-tip stick stamp (fig. 36). After each row was coded the units were placed on display. Each piece of citrus was treated twice--once to code and once to display. Labor requirements varied according to the number of units per crate, the type of coding equipment, and the methods used. When good handling methods were used the porous-tip stick stamp was slightly faster than the band-type adjustable stamp. It was 14 percent faster for grapefruit and 23 percent faster for oranges than a crayon or grease pencil. For this study it was assumed that the average citrus crate contained 72 grapefruit or 240 oranges.

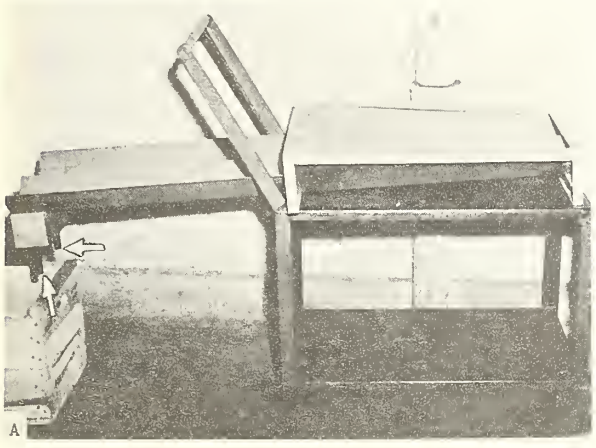
BN-5919



BN-5916

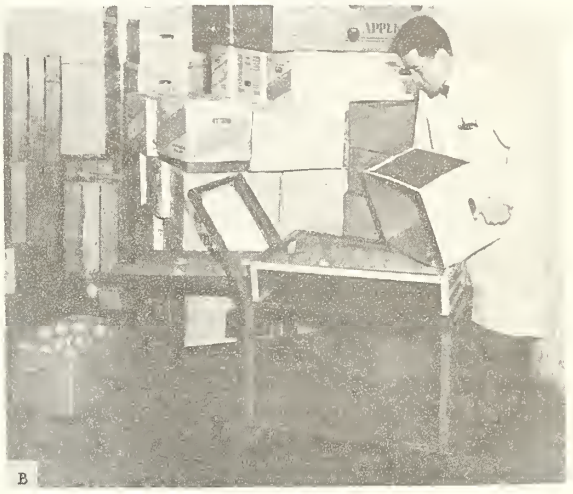
Figure 36.--A typical method of coding and displaying citrus. See "Citrus Coder Cuts Costs" (2).

A citrus coder was developed to eliminate the necessity of individually coding by hand each citrus unit. The coder consists of a hopper, into which the crate of citrus is dumped, which is designed to be mounted on platform-type stocking trucks (fig. 37). Incorporated in the hopper and extending beyond it are 2 parallel grooves which serve to track the citrus individually over the coding device. This device consists of an individual multi-impression, porous-tip stick stamp which is placed in a recessed hole at the discharge end of each track. An impression is made on each piece of fruit as it rolls down the groove and over the stick stamp. The hopper and extended grooves are adjustable to provide the correct pitch to cause the citrus to roll down the grooves. For example, sizes 46 and 54 grapefruit require a steeper pitch than a size 288 orange.



BN-5981

The coder (black sticks below the ends of troughs are stick-type stamps, see arrows)



BN-5926

The coder in use

Figure 37.--An improved method for handling citrus.

Two apple boxes of 1-1/8-bushel capacity were used to catch coded fruit at the discharge end of the coder. This type of box is recommended because: (1) Produce departments normally have an ample supply of these boxes; (2) they can be double stacked; (3) they have a wood strap across the two ends which provides a convenient handhold; and (4) two of them will hold a crate of citrus. The 2 empty boxes are placed side by side on the floor at the discharge end of the citrus coder chutes. The full crate of citrus is placed diagonally on the hopper as illustrated in figure 37. As the operator dumps the citrus in the hopper he watches for poor-quality or off-size citrus and removes such pieces as they roll down the chutes. An approximately equal amount of citrus should be dumped into each of the 2 chutes. The amount of citrus in each of the 2 apple boxes is then equalized and the boxes are stacked on a skid or truck ready to be taken for displaying. 17/

An advantage of having the coded citrus in the apple boxes is that they can be readily lifted and dumped on the display (fig. 38), whereas the weight

17/ For construction details of revised citrus coder see appendix, fig. 56.

of a full crate of citrus will normally cause the operator to display 2 or more units at a time. When citrus is received in 1/2-crate cardboard cartons it can be coded directly into the cartons and either closed and stacked or moved directly to the floor for display.

BN-5882

Figure 38.--Coded citrus is dumped on the display.

The code stamped on the citrus may be either numerical or alphabetical. In this study two sets of porous-tip stick stamps from "0" through "6" were used. This provided a code for a maximum of 7 types and sizes of grapefruit or oranges. If an alphabetical code is desired it is suggested that such letters as A, I, O, S, X, and W be used as they are not easily mistaken for other letters. It is not recommended that the actual price be placed on each unit since it would be necessary to show whether the price is per unit, per half dozen, or per dozen and would require large sets of stick stamps to handle all possible variations. In recent tests color codes have been used successfully with the coder.

To insure maximum productivity in the use of the citrus coder, it is suggested that the entire day's receipts be coded at one time. Coding the day's receipts at one time eliminates all but one of the setup and cleanup times which otherwise would occur when each case is handled individually. When the crates of citrus are processed individually, it is necessary to position the coder, obtain and ink the stamps, and put away the stamps and coder for each crate handled.

The citrus coder for handling oranges required 4.56 man-minutes per crate, and was 158 percent more productive than the typical method as noted above and 110 percent more productive than the most productive of the conventional methods. The labor requirements for the complete handling of a crate of grapefruit using the citrus coder and dumping the grapefruit on the display is 4.54 man-minutes (fig. 39). This method of handling grapefruit is 60 percent more productive than the current typical method (code with crayon or grease pencil at the display area and place on display by hand), and 40 percent more productive than the most productive of the conventional methods (code with stick stamps and display by hand.) These production figures include setup and takedown time for the coder if the entire day's receipts are coded at one time.

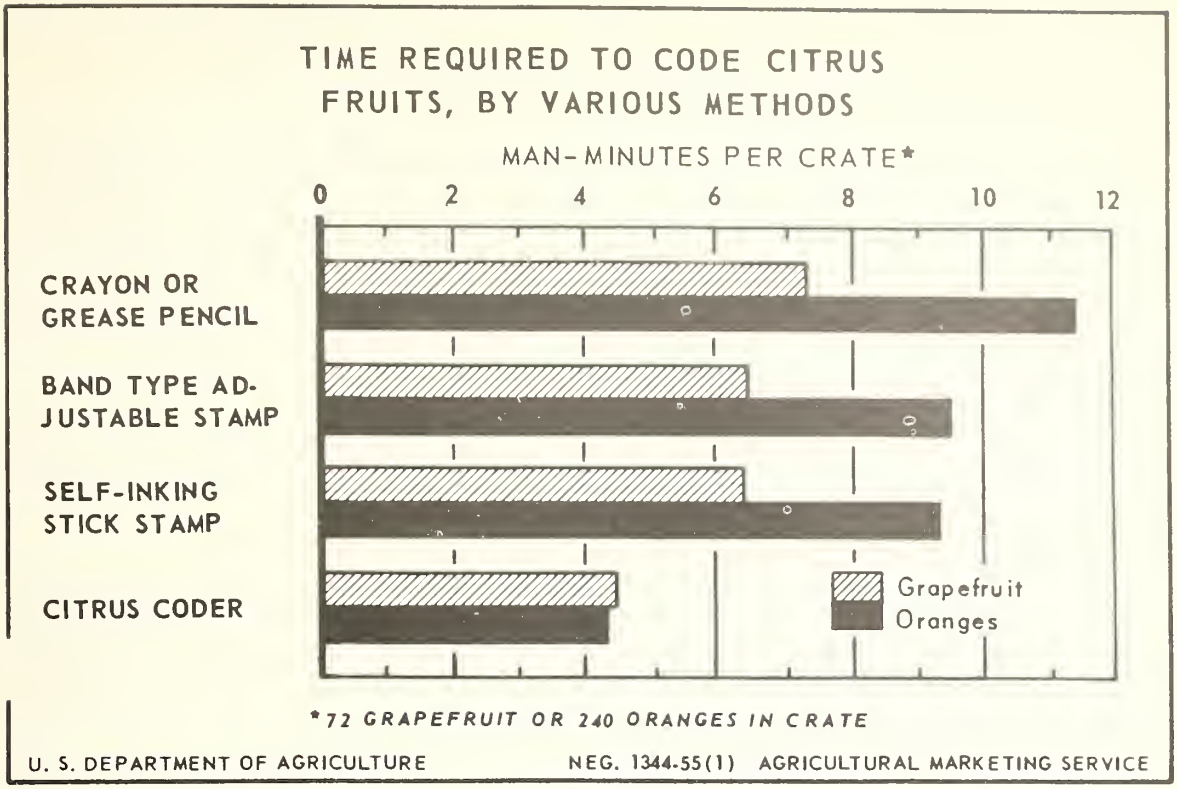


Figure 39.

Preparation of Lettuce for Sale

Lettuce can be sold without a price mark affixed, provided all lettuce is sold for one price and that price is on the cashier's price chart. If lettuce is graded into more than one price, a code mark can be used to identify the lettuce or the price can be written on the butt of each head with an indelible pencil. 18/

To minimize loss of leaves and to improve the appearance of the lettuce display, a half-inch wire-enclosed paper tie can be wrapped around it. The price of the lettuce is placed on the tie. This price-marking operation is most economically performed before banding. The paper ties may be price-marked with a wax pencil, ball-point pen, adjustable-band stamp, or a porous-tip stick stamp. Of these methods, only the adjustable-band stamp and the stick stamp were found by preliminary time studies to warrant further study. The standard time per bunch of 1,000 paper ties was 32 minutes when marked with the adjustable-band stamp and 25 minutes when marked with the stick stamp. 19/

18/ Code marks are easier to write than numbers but because they tend to impose an added burden on the cashiers, this method was not tested.

19/ The self-inking adjustable band stamp was not quite as productive as the stick stamp because it was more difficult to locate the impression on the wire-enclosed paper tie.

The price-marked wire-enclosed paper ties may be applied as the lettuce is trimmed or displayed or as a separate operation in the back room. It is most economically applied as the lettuce is being trimmed (1).

A convenient method of storing the priced wire-enclosed paper ties is a tiered box with several compartments for ties of different sizes. The top or deepest section is for 20-inch paper ties to be used on lettuce, the middle section for paper ties for celery, and the low section for pineapple, parsley, and green onions. The box can be hung on the display fixture or on the stocking cart, or at the trim station. When newly priced paper ties are placed in a compartment, the old paper ties in the section should be removed and consolidated with the new ones, otherwise many will be bent.

Although the wire-enclosed paper tie offers some protection from loss of outer leaves it will not give the protection offered by a complete film covering. The most commonly used types of film in lettuce packaging are cellophane bags, cellophane sheets, and polyethylene bags.

The cellophane bag may be marked with the same price-marking equipment as the wire-enclosed paper tie. Since the porous-tip stick stamp is the most productive, it is the only device considered here. The bag can be marked before packaging or in conjunction with display. The time required for price-marking the cellophane bags before filling is 38 minutes per 1,000 bags; for price-marking after display, the standard time per 1,000 bags is 17 minutes, a saving of 21 minutes. To achieve this production rate the employee should display a layer, price-mark that layer, put another layer on display, stamp it, and so forth. During peak sales periods it may be advisable to price the bags before filling to avoid interference with the customers.

Lettuce may be bagged by hand or with a special funnel. When bagging by hand, the operator grasps the bag on one corner of the opening tab with his left hand and the head of lettuce with his right hand. As he lifts the bag, its mouth falls open and he inserts the head of lettuce. With his right hand he grasps the other corner of the bag while moving his left hand down, to hold the bag on each upper corner about a half-inch below the top of the lettuce head. He then whirls the bag, causing the lower part of the bag to rotate two complete turns. This effectively closes the top of the bag. (The closer the hands are held to the head during twisting, the fewer the twists required and the neater and more secure the wrap obtained.) The filled bag is then placed in a container to be taken to display.

If the lettuce is lightly sprinkled with water preparatory to bagging, the standard time required for hand bagging is 6.1 seconds per bag. When the lettuce is not sprinkled, 6.5 seconds per bag is the standard time required. Thus, sprinkling reduces labor time by 6 percent or a saving of 6 minutes per 1,000 heads, because moist lettuce is more easily slipped into the bags.

The funnel for bagging lettuce is attached to a work table and has a cone formed of several 1-inch-wide straps of stainless steel tapered at the point of the cone. The operator places a cellophane bag over the cone of the funnel and holds it with his left hand while dropping the lettuce into the funnel with his right hand. The weight of the lettuce spreads the steel straps apart and the

head passes into the bag. Care should be exercised in using the funnel to avoid loss of outer leaves and bruising of the head. The bag is closed as in the previous method and the package placed in the container of wrapped lettuce. The time required for bagging, filling, and closing 1,000 heads with the funnel is 193 minutes as opposed to 102 minutes for the hand filling method. The hand method represents a saving of 91 minutes or 47 percent.

Two methods of overwrapping lettuce with a cellophane sheet were studied--by hand using a seal plate and by a machine.

When the hand wrap method is used the operator positions a sheet of film on the wrapping surface with his right hand and a head of lettuce on the film with his left hand. Holding the corner of the film against the head of lettuce with the right thumb, the operator rolls the head onto the film while he rolls the sides of the sheet of film over the head of lettuce with the fingers of both hands to form the package. As he rolls the head into the cellophane, he moves it back onto a seal plate and tack-seals it.

The lettuce-wrapping machine tested was a device for forming the film sheet about the lettuce and sealing the package (fig. 40). To use the machine, a sheet of film is positioned over the hole in the top of the machine and a head of lettuce is positioned over the film and pushed down through the hole into a cup. A switch is activated and the jaws of the machine seal the film and the wrapped head is ejected. The most effective method of pricing the lettuce is with a porous-tip stick stamp and the same procedure as outlined for pricing cellophane bags at display.

A BN-5918

Placing head in machine

B BN-5920

Machine ejecting wrapped head

Figure 40.--Packaging lettuce on a semiautomatic machine.

Comparative costs of labor and materials for the several methods of packaging or pricing lettuce are presented in table 25 and figure 41. These data show that the method of preparing lettuce for sale with the wire-enclosed paper tie is the cheapest method that affords some protection to the lettuce. 20/

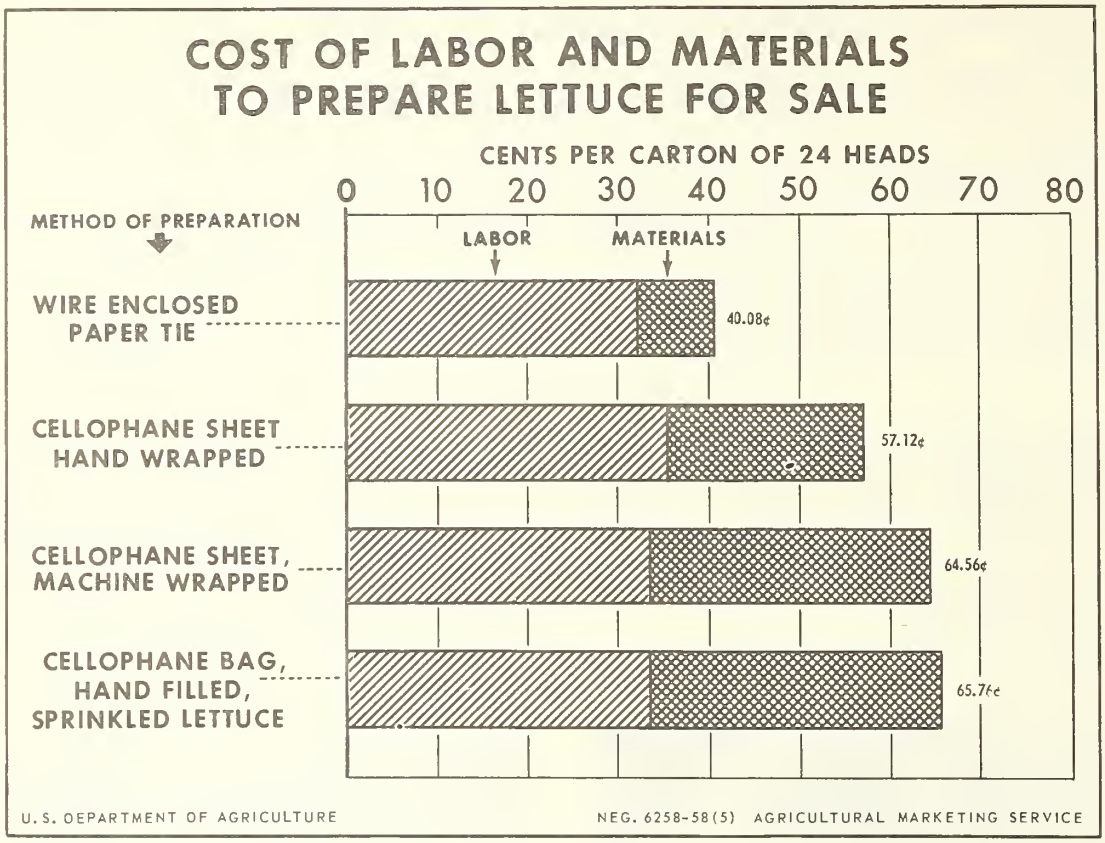


Figure 41.

When the lettuce is packaged in cellophane the cheapest method is hand overwrapping. This is due primarily to the lower costs of materials--0.90 cent for the average film sheet of 15- by 15-inch cellophane, 1.30 cent for an 18- by 18-inch film sheet for machine overwrapping, and 1.34 cent for the cellophane bag. Costs may be further reduced by using second-quality cellophane when it is available.

Other factors, which were not evaluated, also tend to favor the manual overwrapping of lettuce in cellophane. One of these factors is that the hand-wrapped package is neater than the machine-wrapped package because of surplus cellophane left on the latter. A second factor is that the heat-sealed, overwrapped package has a more secure seal than either the cellophane bag or the machine-wrapped package. The cellophane package provides a complete cover over

20/ Tests were made to evaluate a new type of polyethylene bag with the opening in the side rather than the top. A comparison of this bag with hand-wrapped lettuce in cellophane sheets resulted in the same total costs of labor and materials.

the head, thus giving greater protection from damage due to handling and from drying and discoloration.

Preparation Techniques and Sales

Since the methods used to prepare lettuce for sale result in differences in the package presented to the consumer, sales might be affected by the method of preparation used. Accordingly, a test was made to compare the effects upon sales of the wire-enclosed paper tie with the effects of the cellophane bag. The test was conducted by rotating the 2 methods among 4 stores for a period of 8 weeks. The stores belonged to one chain organization, had about equal sales volume, were patronized by about the same type of clientele, and most of the competition of each of them was from units of the same two chains.

The results of this test are presented in table 16. The average index of lettuce sales for all 4 stores when cellophane bags were used was 100.1; when the wire-enclosed paper tie was used, the average index of lettuce sales was 99.9. On this basis it is concluded that there is no difference between the two types of packages in their effect on sales. No tests are available to indicate the effect on sales of hand-wrapped lettuce as compared with cellophane bags or paper ties.

Table 16.--Index of number of heads of lettuce sold in 4 stores using cellophane bags for 4 weeks and wire-enclosed paper ties for 4 weeks 1/

(For each store, average sales for 8-week period = 100)

Week	Cellophane bags for first 4 weeks and wire-enclosed paper ties for the second 4 weeks		Wire-enclosed paper ties for first 4 weeks and cellophane bags for the second 4 weeks	
	Store A	Store B	Store C	Store D
	Percent	Percent	Percent	Percent
1....	109.0	98.8	103.3	100.2
2....	97.8	105.7	105.0	100.6
3....	103.1	101.6	103.3	96.0
4....	102.7	105.8	107.9	95.8
5....	102.1	103.1	98.4	98.4
6....	93.1	102.4	94.8	101.9
7....	97.8	85.8	91.5	103.4
8....	110.5	91.5	90.4	98.3

1/ Data adjusted for variation in retail price over time.

Price-Marking Watermelons

Uncut watermelons, whether sold by unit or by weight, offer no price-marking problems. When they are halved or quartered they must have some protection from handling by employees and customers. An effective method found for handling halves sold by the unit was to cover the exposed inside surface with a sheet of transparent film and secure the film with a piece of pressure-sensitive tape. Quartered watermelons, which typically accounted for the bulk of units handled in the experiment, were partially overwrapped. A sheet of transparent

film was placed diagonally over the exposed cut surface and the film was wrapped around the melon and tack-sealed on a seal plate. The unit price was stamped on the film on the right hand side of the melon with a porous-tip stick stamp. When the cut melons were sold by weight they were weighed and labeled on a separate label printer and scale combination.

Two other packaging techniques were evaluated: Placing a sheet of polyvinyl film over the cut surface and putting the cut melon in a polyethylene bag. A comparison of costs of labor and materials indicated that cellophane packaging of both halves and quarters resulted in the lowest cost (table 17). 21/

Table 17.--Evaluation of costs of labor and materials per piece for packaging and pricing watermelons in polyvinyl, cellophane (2d grade), and polyethylene bags

Type of material used	Halves wrapped in--			Quarters wrapped in--		
	Polyethylene	Polyvinyl	Cellophane	Polyethylene	Polyvinyl	Cellophane
	Cents	Cents	Cents	Cents	Cents	Cents
Labor cost...	.92	1.02	.90	.91	.96	.85
Film cost....	3.92	.69	.80	1.29	.73	.90
Label cost...	.14	.14	--	.14	.14	--
Total...	4.98	1.85	1.70	2.34	1.83	1.75

Price-Marking Miscellaneous Produce Items

For many items sold by the unit, a stamped impression is adequate. Items typically priced in this manner are melons, avocados, film-capped berries in boxes, and items packaged by growers or repackers such as cranberries, dried fruits, nuts, garlic, mushrooms, brussel sprouts, carrots, parsnips, turnips, spinach and other greens, slaw, and tossed salads. The most effective means of pricing these items was with a multi-impression, porous-tip stick stamp. To facilitate this pricing operation a new type of stamp holder was developed in which the tips of the stamp were always moist (fig. 42). (For construction details of stamp holder see appendix, fig. 57.) A foam rubber pad was placed in an aluminum pan, and the wood holder with tapered holes for the stamps rested on the pan about 1/4 inch above the pad. Stick stamps with plastic instead of wooden handles are now available. An advantage of using them is that they fit easily into the holes in the wooden holder because the diameters of the handles are uniform. When the pad was re-inked once or twice monthly the stamps were always ready for use. If there is too much ink on the stamp, as is the case immediately after re-inking the pad, the operator should use an especially light touch.

The porous-tip stick stamp eliminates the need to adjust bands for each use--as much time is required to change the price on a band stamp as to make

21/ Limited tests were made to measure the effect of these prepackaging techniques on sales in 2 stores. Where the cellophane wrap was displayed beside the polyvinyl wrap, cellophane was preferred over polyvinyl by 37 percent. Where cellophane was displayed beside polyethylene, customers preferred cellophane by 6 percent.

A BN-5912 Assembled

B BN-5906 Parts, including metal pan, wooden holder, foam rubber ink pad, stamp

Figure 42.--Re-inking holder for porous-tip, multi-impression stick stamps.

20 impressions with a stick stamp. It is important to limit the number of stamps in the set to eliminate fumbling when selecting or returning a stamp. The set illustrated has 18 single-price and 8 multiple-price stamps, and represents approximately 85 percent of the prices used by the stores for which it was designed. It is recommended that each produce department have a self-inking band stamp for prices not on the set. The stamps ink themselves in the holder, eliminating the necessity to ink before each use. Table 18 shows the times to price-mark by 4 methods. The re-inking stamp set will save up to 9.7 hours per 1,000 cases stamped.

Table 18.--Time per box of 24 units to price-mark produce with 4 types of pricing equipment

Items marked	Ball-point pen or grease pencil	Self-inking band-type adjustable stamp	Stick-type stamp set	Improved re-inking stamp set for stick stamp
	Minutes	Minutes	Minutes	Minutes
Box of 24 units	0.830	0.350	0.290	0.245
	Man-hours	Man-hours	Man-hours	Man-hours
1,000 boxes	13.9	5.8	4.8	4.1

For price changes and for such items as eggplant and individually priced peppers, which are not easily priced with a stamped impression, a pressure-sensitive label is an effective method of providing space for price marking.

Savings from Adoption of Improved Methods

To measure the savings resulting from the improvements presented in this report, installations were made in 2 stores of each of 2 retail organizations. All of the improvements were installed in one of the stores and most of them were installed in the other 3 stores. Produce was sold on a self-service basis

in all 4 of the stores. Weekly savings through use of the improved methods, equipment, layout, and materials recommended in this report ranged from $21.85 to $67.46 (table 19).

Table 19.--Weekly savings from use of improved practices in 4 retail stores

Store	Produce sales per week	Savings
	Dollars	Dollars
A	1,800	21.85
B	2,600	42.42
C	3,800	49.17
D	6,400	67.46

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Table 20.--Comparative annual costs of equipment, label, and labor for weighing and labeling produce packages by 4 different methods using outside and inside labels, 1957

Cost item	Separate label printer and scale combination			Combined scale-printer		Conventional scale		Electronic printer-scale-outside label
	Outside label applied with--		Inside label	Outside label applied with activator	Inside label	Write on: thermo-plastic outside label	Pressure-sensitive label	
	Activator	Hand iron						
	Fixed cost							
Prepack scale 1/.....Dol.	69.50	69.50	69.50	--	--	48.50	48.50	--
Label printer 1/.....Dol.	105.50	105.50	105.50	--	--	--	--	--
Scale-printer comb. 1/Dol.	--	--	--	197.40	197.40	--	--	425.00
Label activator 2/....Dol.	19.50	--	--	19.50	--	--	--	--
Commodity slugs.....Dol.	40.00	40.00	40.00	27.50	27.50	--	--	40.00
Interest on investment.....Dol.	51.34	48.71	48.71	55.20	52.57	12.00	12.00	110.59
Maintenance, scale only.....Dol.	3/ 10.00	--	--	--	--	3/ 10.00	3/ 10.00	--
Printer and scale.....Dol.	4/ 35.91	4/ 35.91	4/ 35.91	85.00	85.00	--	--	5/120.00
Annual total.....Dol.	331.75	299.62	299.62	384.60	362.47	70.50	70.50	695.59
	3,000 packages per week							
Total fixed.....Dol.	331.75	299.62	299.62	384.60	362.47	70.50	70.50	695.59
Cost per label.....Cts.	6/ .051	.051	7/ .030	.083	.051	8/ .097	.140	.051
Total.....Dol.	79.56	79.56	46.80	129.48	79.56	151.32	218.40	79.56
Labor per unit 9/.....Cts.	.410	.380	.360	.392	.438	.690	.675	.205
Total.....Dol.	639.60	592.80	561.60	611.52	683.28	1,076.40	1,053.00	319.80
Annual--Total.....Dol.	1,050.91	971.98	908.02	1,125.60	1,125.31	1,298.22	1,341.80	1,094.95
Per package.....Cts.	0.67	0.62	0.58	0.72	0.72	0.83	0.86	0.70
	6,000 packages per week							
Total fixed.....Dol.	331.75	299.62	299.62	384.60	362.47	70.50	70.50	695.59
Cost per label.....Cts.	.051	.051	.030	.083	.051	.097	.140	.051
Total.....Dol.	159.12	159.12	93.60	258.96	159.12	302.64	436.80	159.12
Labor per unit 9/.....Cts.	.410	.380	.360	.392	.438	.690	.675	.205
Total.....Dol.	1,279.20	1,185.60	1,123.20	1,223.04	1,366.56	2,152.80	2,106.00	639.60
Annual--Total.....Dol.	1,770.07	1,644.34	1,516.42	1,866.60	1,888.15	2,525.94	2,613.30	1,494.31
Per package.....Cts.	0.57	0.53	0.49	0.60	0.61	0.81	0.84	0.48
	9,000 packages per week							
Total fixed.....Dol.	331.75	299.62	299.62	384.60	362.47	70.50	70.50	695.59
Cost per label.....Cts.	.051	.051	.030	.083	.051	.097	.140	.051
Total.....Dol.	238.68	238.68	140.40	388.44	238.68	453.96	655.20	238.68
Labor per unit 9/.....Cts.	.410	.380	.360	.392	.438	.690	.675	.205
Total.....Dol.	1,918.80	1,778.40	1,684.80	1,834.56	2,049.84	3,299.20	3,159.00	959.40
Annual--Total.....Dol.	2,489.23	2,316.70	2,124.82	2,607.60	2,650.99	3,753.66	3,884.70	1,893.67
Per package.....Cts.	0.53	0.50	0.45	0.56	0.57	0.80	0.83	0.40
	12,000 packages per week							
Total fixed.....Dol.	331.75	299.62	299.62	384.60	362.47	70.50	70.50	695.59
Cost per label.....Cts.	.051	.051	.051	.083	.051	.097	.140	.051
Total.....Dol.	318.24	318.24	187.20	517.92	318.24	605.28	873.60	318.24
Labor per unit 9/.....Cts.	.410	.380	.360	.392	.438	.690	.675	.205
Total.....Dol.	2,558.40	2,371.20	2,246.40	2,446.08	2,733.12	4,305.60	4,212.00	1,279.20
Annual--Total.....Dol.	3,208.39	2,989.06	2,733.22	3,348.60	3,413.83	4,981.38	5,156.10	2,293.03
Per package.....Cts.	0.51	0.48	0.44	0.54	0.55	0.80	0.83	0.37

1/ Based on a 10-year depreciation.
2/ Based on a 5-year depreciation.
3/ Two calls per year @ $5.00 per call.
4/ Maintenance costs are $39.90 per year with the first year free.
5/ Based on an estimate by manufacturer. No maintenance costs available.
6/ $54.05 for 45 rolls of 2,340 labels each. Two-color 1-1/2" x 2-3/4" labels in lots of 3 million--.051 cent each for inside labels, 0.83 cent each for outside labels.
7/ $31.78 for 45 rolls of 2,340 each.
8/ 97¢ per 1,000 labels which consisted of cost of labels, 82.6¢; cost of handling, 13.6¢; and cost of freight, 0.8¢.
9/ All labor costs computed on basis of $1.50 per hour or 2.5 cents per man-minute.

Table 21.--Development of production standard for hand filling 10 pounds of potatoes in kraft-type bags on a bagging table

Element description	Element time	Frequency: element of: occurrence:	Standard time per 10-pound bag
	Minutes	Percent	Minutes
Obtain empty bag and open	0.051	100.0	0.051
Fill by hand and weigh	.340	100.0	.340
Close bag and fold mouth	.058	100.0	.058
Staple (3 staples)	.053	100.0	.053
Dispose bag to stock truck	.041	100.0	.041
Obtain 100-pound sack of potatoes	.370	10.0	.037
Cut strings	.232	10.0	.023
Dump on table	.303	10.0	.030
Dispose empty sack	.086	10.0	.009
Obtain supply of empty kraft-type bags	.547	1.2	.005
Obtain stamp and stamp pad	.140	1.2	.002
Adjust stamp	.190	1.2	.002
Stamp price and code on bag	.019	100.0	.019
Dispose stamp and stamp pad	.211	1.2	.003
Dispose unpriced bags	.125	1.2	.002
Check price	.568	1.2	.007
Sort out bad potatoes	.157	5.0	.008
Obtain knife	.130	.5	.001
Obtain stapler	.355	.8	.003
Fill stapler	.535	1.4	.007
Obtain stock truck and position	.403	1.2	.005
Dispose salvage	.380	.6	.002
Restaple bag	.076	.4	--
Refill bag	.940	.4	.004
Adjust weights on scale	.108	1.2	.001
Set up work area	.212	1.2	.003
Clean up	.330	1.2	.004
Cover truck with sack	.114	.4	--
Total minutes per 10-pound bag	--	--	.720
Personal and fatigue allowance: 15 percent	--	--	.108
Standard time in minutes per bag	--	--	.828
Standard number of 10-pound bags packaged per man-hour	--	--	72

Table 22.--Produce movement for 1 year in 50 stores of a retail food chain

Item	Percent of total customer purchase units	Item	Percent of total customer purchase units
Apples	5.45	Kale	.01
Apricots	.06	Leeks	.11
Artichokes	.02	Lemons	2.51
Asparagus	.19	Lettuce:	
Avocados	.23	Iceberg	7.12
Bananas	7.94	Romaine, Boston, leaf, and flagg	1.75
Beans	2.05	Limes	.05
Beets	.24	Mangoes	.15
Berries:		Melons	.88
Blueberries	.49	Mint	.08
Strawberries	1.20	Mushrooms	.34
Broccoli	.19	Mustard greens	.01
Brussels sprouts	.18	Nectarines	.32
Cabbage	1.64	Okra	.22
Cantaloup	3.57	Onions	2.65
Carrots	2.24	Oranges	10.65
Cauliflower	.41	Papayas	.42
Celery	3.39	Parsley	.90
Cherries	.47	Parsley roots	.76
Chestnuts	.08	Parsnips	.14
Chicory (also called endive)	.38	Peaches	1.26
Collards	.06	Pears	1.38
Cranberries	.07	Peas	.20
Cucumbers	2.53	Peppers	.91
Corn	1.54	Pineapples	.33
Chives	.01	Plums	.80
Dandelion	.11	Potatoes	9.29
Dill	.31	Pumpkins	.01
Dried fruits and nuts:		Radishes	3.36
Prunes	.13	Rhubarb	.05
Misc. fruits	.14	Scallions	1.18
Dates	.24	Sourgrass	.01
Figs	.07	Spinach	.09
Nuts	.33	Squash	.56
Eggplant	.27	Tomatoes	4.72
Escarole	.94	Turnips	.35
French endive (witloof)	.05	Watercress	.10
Garlic	.69	Yams	.40
Grapefruit	5.05		
Grapes	2.72	Total	100.00
Horseradish	.25		

TABLE 23.--Suggested materials and methods for packaging and price-marking at retail of specified fresh fruits in various consumer packages.

COMMODITY AND SIZE	CONSUMER PACKAGE STYLE AND SIZE	TRAY OR BAG SIZE P=Polyethylene C=Cellophone	FILM SHEET SIZE IN INCHES D=DIAMOND SHAPE	TYPE OF PACKAGE CLOSURE OR BINDER AND SPECIAL TOOLS USED	PRICE UNIT	METHOD OF PRICE MARKING	REMARKS
Apples, fancy, 100's to 125's.	Tray, 4 apples. Tray, 6 apples. Tray, 8 apples.	#1 tray #2 #5	12x12 15x15 D 16x16 D	Heat-seal with hand iron. do. do.	Per lb., catch weights. do. do.	Thermoplastic label. do. do.	May use 8x16" film sleeve wrap.
Apples, eating and cooking, 135's to 163's.	Tray, 8 apples Bag, 3 lb. Bag, 4 lb. Bag, 5 lb.	#5 P 5x3-1/3x14" P 6x3x15" P 6x3-1/2x16"	15x15 D	do. 3/8" red crepe-backed tape. do. do.	do. Per lb., catch weights, or fill to even weights.	do. Thermoplastic label, or stamp price on bag.	Use thermoplastic label for catch weights. For even weights use self-inking band stamp which marks weight, commodity, and price in 1 impression. If date code is required use band stamp and pad to mark weight, commodity, code, and price in 1 impression.
Apricots	Tray, 8 to 10 apricots. Tray, 12 to 15 apricots.	#1 #2	11x11 13x13 D	Heat seal with hand iron. do.	Per lb., catch weights. do.	Thermoplastic label. do.	
Bananas	Bunch, sizes vary.			1" gummed kraft tape or 1/2" crepe-backed tape, usually red.	do.	Write price on tape.	
Berries	Film covered till, pint. Film covered till, quart.		9x9 10x10	Rubber band. do.	Per package. do.	Stamp price on cellophane. do.	Second quality cellophane may be used to cover tills if it is available.
Cantaloups	Loose.				Per cantaloup.	do.	Stamp on stem end. Put a layer on the display and then stamp the whole layer.
Cherries	Tray, 8 to 10 oz. Tray, 12 to 16 oz. Bag, 8 to 16 oz.	#0 #1-1/2 C 4x2-3/4x12"	10x10 12x12 D	Heat-seal with hand iron. do. Heat-seal or staple.	Per lb., catch weights. do. do.	Thermoplastic label. do. do.	
Grapes	Tray, 3/4 to 1-1/4 lb. Tray, 1-1/4 to 2 lb. Deep dish, 1-1/4 to 2 lb.	#1-1/2 #2 7-1/4x4-1/2x1-3/4"	12x12 D 14x14 D 13x13	Heat-seal with hand iron. do. do.	do. do. do.	do. do. do.	
Grapefruit, 54's to 96's.	Loose. Film wrap on board, 2 grapefruit. Film wrap on board, 3 grapefruit. Bag, 6 grapefruit. Bag, 8 to 10 grapefruit.	 P 6x3-1/2x16" P 8x3x20"	 13x13 D 14x14 D 	 do. do. 3/8" crepe-backed tape. do.	Per grapefruit. Per package. do. Per bag. do.	Stamp code on fruit, price sign at display, pricelist at check-out. Thermoplastic label. do. Stamp price on bag. do.	If use bulk display, code with citrus coder. If code large fruit only, code with stick stamp. Size of bag required depends upon the size and number of grapefruit.

Lemons	Tray, 4 to 5 lemons. Bag, 6 lemons. Bag, 12 lemons.	#1 C 4x2-3/4x12" P 4x2-3/4x12" P 5x3-1/2x13"	11x11 11x11	Heat-seal with hand iron. Staple or heat-seal. 3/8" crepe-backed tape. do.	Per package. Per bag. do. do.	Thermoplastic label. Stamp price on bag. do. do.	 Self-inking band stamp may be used to mark commodity and price with 1 impression.
Oranges, 176 200 to 220 176 200 to 220 250 to 288 All sizes	Tray, 3 oranges. do. Tray, 6 oranges. do. Bag, 12 oranges do. Loose.	#1-1/2 #1-1/2 #2 #2 P 6x3-1/2x15" P 5x3-1/2x16"	13x13 D 12x12 15x15 D 14x14 D	Heat-seal with hand iron. do. do. do. 3/8" crepe-backed tape. do.	Per package. do. do. do. Per bag. do. Per orange or per dozen.	Thermoplastic label. do. do. do. Stamp price on bag. do. Stamp code on orange, price sign at display, pricelist at checkout.	May use 8x14" film sleeve wrap. May use 8x16" film sleeve wrap. If use bulk displays, code oranges with citrus coder. If code large fruit only, code with stick stamp.
Peaches, over 2"	Tray, 4 peaches. Tray, 6 peaches. Tray, 8 peaches. Film covered basket, varies.	#1 #2 #5	11x11 14x14 D 16x16 D Size to fit basket.	Heat-seal with hand iron. do. do. Rubber band.	Per lb., catch weights. do. do. do.	Thermoplastic label. do. do. do.	 May use 8x16" film sleeve wrap.
Pears, 100 to 165	Tray, 4 pears. Tray, 6 pears. Tray, 8 pears.	#1 #2 #5	11x11 14x14 D or 15x15 D 16x16 D	Heat-seal with hand iron. do. do.	do. do. do.	do. do. do.	Use wrappers if fruit is ripe. Pack on sides with stems toward center of the tray.
Plums, 5x5, 4x5, and 4x4. All sizes	Tray, 6 to 8 plums. Tray, 9 to 12 plums. Film covered till.	#1-1/2 #2	12x12 D 14x14 D 12x12	do. do. Rubber band.	do. do. Per package.	do. do. Stamp price on cellophane.	Can use 8x14" cellophane sleeve wrap. Can use 8x16" cellophane sleeve wrap.
Rhubarb	Tray, 1 to 1-1/2 lb. Bundle, 1 to 2 bunches.	#5	15x15 D	Heat-seal with hand iron. Wire-enclosed paper tie.	Per lb., catch weights. Per bundle.	Thermoplastic label. Stamp price on tie.	Cut tray to length of stalks.
Tangerines	Tray, 4 to 5 tangerines. Tray, 6 to 8 tangerines. Bag, 12 tangerines.	#1 #2 P 5x3-1/2x16"	11x11 14x14 D	Heat-seal with band iron. do. 3/8" crepe-backed tape.	Per package. do. Per bag.	Thermoplastic label. do. Stamp price on bag.	 Use self-inking band stamp to mark commodity and price with 1 impression.
Watermelons	Film wrapped quarters. Film covered halves.		15x15 12x15	Heat-seal on plate. Encircle on either end with band of 3/8" crepe-backed tape.	Per quarter. Per half.	Stamp on cellophane over the rind. do.	Place film diagonally over quarter wedge of melon and tack seal on bottom. Lay film over the cut surface of the melon half. Second grade cellophane may be used.

TABLE 24.--Suggested materials and methods for packaging and price-marking at retail of specified fresh vegetables in various consumer packages.

COMMODITY AND SIZE	CONSUMER PACKAGE STYLE AND SIZE	TRAY OR BAG SIZE P=Polyethylene C=Cellophone	FILM SHEET SIZE IN INCHES D=DIAMOND SHAPE	TYPE OF PACKAGE CLOSURE OR BINDER AND SPECIAL TOOLS USED	PRICE UNIT	METHOD OF PRICE MARKING	REMARKS
Asparagus	Tray, 3/4 to 1-1/2 lb. Bunch, 1/2 to 2 lb.	#5 tray	15x15 D	Heat-seal with hand iron. 1/2" crepe-backed tape.	Per lb., catch weights. Per bunch.	Thermoplastic label. Write price on tape.	Affords maximum protection. Display bunches upright in pan with butts in water.
Beans (green, wax, and pole)	Tray, 3/4 to 1-1/4 lb. Tray, 1-1/2 to 2 lb. Bag, 3/4 to 1-1/2 lb.	#2 #5 C 4x2-3/4x12" P 4x2-3/4x12"	13x13 D 15x15 D	Heat-seal with band iron. do. Staple or heat-seal. 3/8" crepe-backed tape.	Per lb., catch weight. do. do. do.	Thermoplastic label. do. do. do.	Using the nest technique, place first layer of beans in tray neatly and dump the remainder.
Beets	Bunch.			Wire-enclosed paper tie or rubber band.	Per bunch.	Sign over display and pricelist at checkout.	
Broccoli	Bunch, film wrapped.		15x15 D	Wire-enclosed paper tie and heat-seal cellophane with hand iron.	Per bunch.	Thermoplastic label.	
Cabbage	Film wrapped, 1/2 head. Loose, whole head.		13x13	Heat-seal with hand iron.	Per lb., catch weights. do.	do. Write price on butts.	
Carrots	Bag. Bunch.	Supplier pack.		Rubber band.	Per bag. Per bunch.	Stamp price on bag. Sign over display and pricelist at checkout.	
Cauliflower	Tray, about 3/4 lb. of florets. Loose, whole head. Film wrapped, whole head.	#1-1/2	12x12 D 16x16	Heat-seal with seal plate. do.	Per lb., catch weights. Per head, by size. do.	Thermoplastic label. Write price on butt. Thermoplastic label.	
Celery hearts	Bunch, 2 to 3 stalks.			Rubber band.	Per bunch.	Sign over display and pricelist at checkout.	May use film sleeve wrap.
Celery	1 stalk			Rubber band.	Per stalk.	do.	Can use colored rubber bands to code if sell more than one price line.
Corn	Tray, 3 ears. Tray, 5 to 6 ears. Bag, 6 ears. Bag, 12 ears.	#2 #2 P 6x4x14-3/4" P 6x4x18"	13x13 D 15x15	Heat-seal with hand iron. do. 3/8" crepe-backed tape. do.	Per package. do. Per bag. do.	Thermoplastic label. do. Stamp price on bag. do.	Strip all husk or husk from 1 side of ear for tray pack.
Cucumbers	Loose. Tray, 2 to 3 cucumbers. Bag, 3 or more cucumbers.	 #2 C 4-1/2x3-1/4x13"	 13x13 D	 Heat-seal with hand iron. Staple or heat-seal.	Per cucumber. Per package. Per bag.	Sign over display and pricelist at checkout. Thermoplastic label. Stamp price on bag.	
Lettuce	Banded. Film wrapped, 1 head. Bag.	 C 6x4x9 P 10-1/2x8-1/2x13"	 15x15	Wire-enclosed paper tie. Heat-seal with seal plate. Twist top corners. do.	Per head. do. do. do.	If sell more than one price line stamp price on tie. If sell more than one price line stamp price on cellophane, otherwise sign over display and pricelist at checkout.	May use second quality cellophane if available.

Onions (dry), large	Band with tape, 1 onion.			1/2" crepe-backed tape.	Per lb., catch weights.	Write price on tape.	Wrap a band of tape around sides of onion on which to mark price.
All sizes	Bag, about 1-1/2 lb.	P 4x2-1/2x12"		3/8" crepe-backed tape.	Per bag or lb., catch weights.	Stamp price on bag, or thermoplastic label.	Use self-inking band stamp to mark weight, commodity, and price in 1 impression.
	Bag, about 3 lb.	P 5x3-1/2x13"		do.	do.	do.	
	Bag, about 5 lb.	P 6x3-1/2x15"		do.	do.	do.	
Onions (green)	Bundle, 1 to 2 bunches.			Rubber band.	Per bundle.	Sign over display and pricelist at checkout.	
Parsley	1 bunch.			Rubber band.	Per bunch.	Sign over display and pricelist at checkout.	Secure facial tissue over stem with rubber band. Keep tissue moist.
Peas	Bag, 1 to 2 lb.	P 4x2-3/4x12"		3/8" crepe-backed tape.	Per lb., catch weights.	Thermoplastic label.	
	Tray, 1 to 2 lb.	#2	13x13 D	Heat-seal with hand iron.	do.	do.	
Peppers, Small	Loose.				Per pepper.	Sign over display and pricelist at checkout.	
Large	Band with tape, 1 pepper.			1/2" crepe-backed tape.	Per lb., catch weights.	Write price on tape.	May use pressure-sensitive label instead of tape on which to mark price.
	Tray, 2 or 3 peppers	#1-1/2	12x12 D	Heat-seal with hand iron.	do.	Thermoplastic label.	
Potatoes, sweet	Bag, about 3 lb.	P 5x3-1/2x13"		3/8" crepe-backed tape.	Per bag.	Stamp price on bag.	
	Bag, about 5 lb.	P 6x3-1/2x18"		do.	do.	do.	
	Tray, 1 to 1-1/2 lb.	#2	13x13 D	Heat-seal with hand iron.	Per lb., catch weights.	Thermoplastic label.	Use this package for selected potatoes only.
Potatoes, white	Bag, 3 lb.	P 5x3-1/2x13"		3/8" crepe-backed tape.	Per lb.	Stamp price on bag.	Use the self-inking band stamp which marks weight, commodity, and price in one impression.
	Bag, 5 lb.	P 6x3-1/2x16"		do.	do.	do.	
	Bag, 10 lb.	P 8x3x19"		do.	do.	do.	
Radishes	1 bunch.			Supplier pack.	Per bunch.	Sign over display and pricelist at checkout.	
	Bag.	Supplier pack.			Per bag.	Stamp price on bag.	
Spinach	Bag, 1 lb.	Supplier pack.			do.	Stamp price on bag.	
	Tray, 3/4 to 1-1/2 lb.	#5	16x16	Heat-seal with hand iron.	Per lb., catch weights.	Thermoplastic label.	Trim and wash if necessary.
Squash (acorn)	Loose.				Per lb.	Write price on yellow area of squash.	
Squash, banana & hubbard	Film wrapped, 3/4 to 1-1/2 lb. cut piece.		15x15	Heat-seal on plate.	Per lb., catch weights.	Thermoplastic label.	
	Loose, whole squash.				Per lb.	Write price on squash.	
Squash, yellow	Tray, 3/4 to 1-1/2 lb.	#2	13x13 D	Heat-seal with hand iron.	Per lb., catch weights.	Thermoplastic label.	Position in tray with stems to center. For larger packages place additional squash on top of interlaced stems.
Squash, zucchini	Tray, 2 to 4 squash.	#2	13x13 D	do.	do.	do.	
Tomatoes	Tray, tube of 3 or 4 tomatoes.	Supplier pack.			Per package.	Stamp price on package.	
	Tray, 2 tomatoes.	#0	9x9	Heat-seal with hand iron.	Per lb., catch weights.	Thermoplastic label.	
	Tray, 4 tomatoes.	#1	12x12	do.	do.	do.	
	Tray, 6 tomatoes.	#2	14x14	do.	do.	do.	

Table 25.--Comparative costs of labor, materials, and shrinkage per head for various techniques of preparing lettuce for sale in retail food stores

Element	Butt pricing	Wire-enclosed paper tie			Cellophane bag			Cellophane	
		Separately	Apply as display	Apply as trim	Hand fill Dry	Hand fill Wet	Funnel	Hand wrap	Machine wrap
	Sec.	Sec.	Sec.	Sec.	Sec.	Sec.	Sec.	Sec.	Sec.
Trim head of lettuce	15.5	15.5	15.5	1/ 19.4	15.5	15.5	15.5	15.5	15.5
Price-mark paper tie	--	1.3	1.3	1.3	--	--	--	--	--
Price-mark cellophane wrapped	--	--	--	--	.9	.9	.9	.9	.9
Display	2/ 3.4	1.3	1/ 6.1	1.3	1.3	1.3	1.3	1.3	1.3
Apply paper tie	--	3.8	--	--	--	--	--	--	--
Place lettuce in bag and close	--	--	--	--	5.6	5.3	10.1	--	--
Overwrap with cellophane	--	--	--	--	--	--	--	6.8	5.0
Misc. trim elements	4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.4
Misc. display elements	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9
Total time per head	25.2	28.2	29.2	28.3	29.6	29.3	34.1	30.8	29.0
Personal and fatigue, 15%	3.8	4.2	4.4	4.2	4.4	4.4	5.1	4.6	4.4
Standard time per head	29.0	32.4	33.6	32.5	34.0	33.7	39.2	35.4	33.4
	Cents	Cents	Cents	Cents	Cents	Cents	Cents	Cents	Cents
Labor cost at $1.50 per hour	1.21	1.35	1.40	1.36	1.42	1.40	1.63	1.48	1.39
Materials cost	--	.32	.32	.32	1.34	1.34	1.34	.90	1.30
Total labor and materials cost	1.21	1.67	1.72	1.68	2.76	2.74	2.97	2.38	2.69

1/ Includes applying paper ties.
2/ Includes writing price on butt.

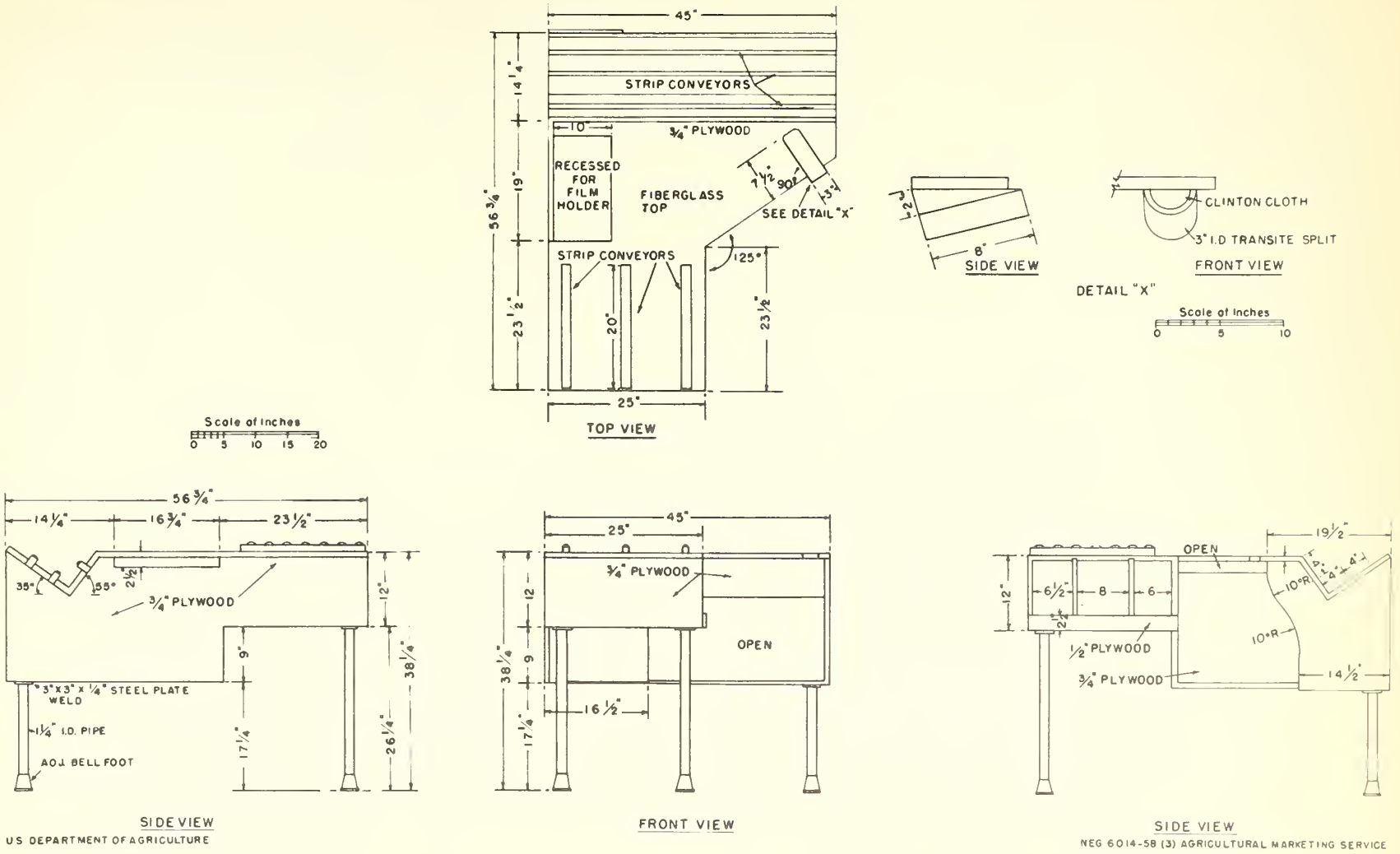


Figure 43.--Construction details for Redi-Reach-Rap table.

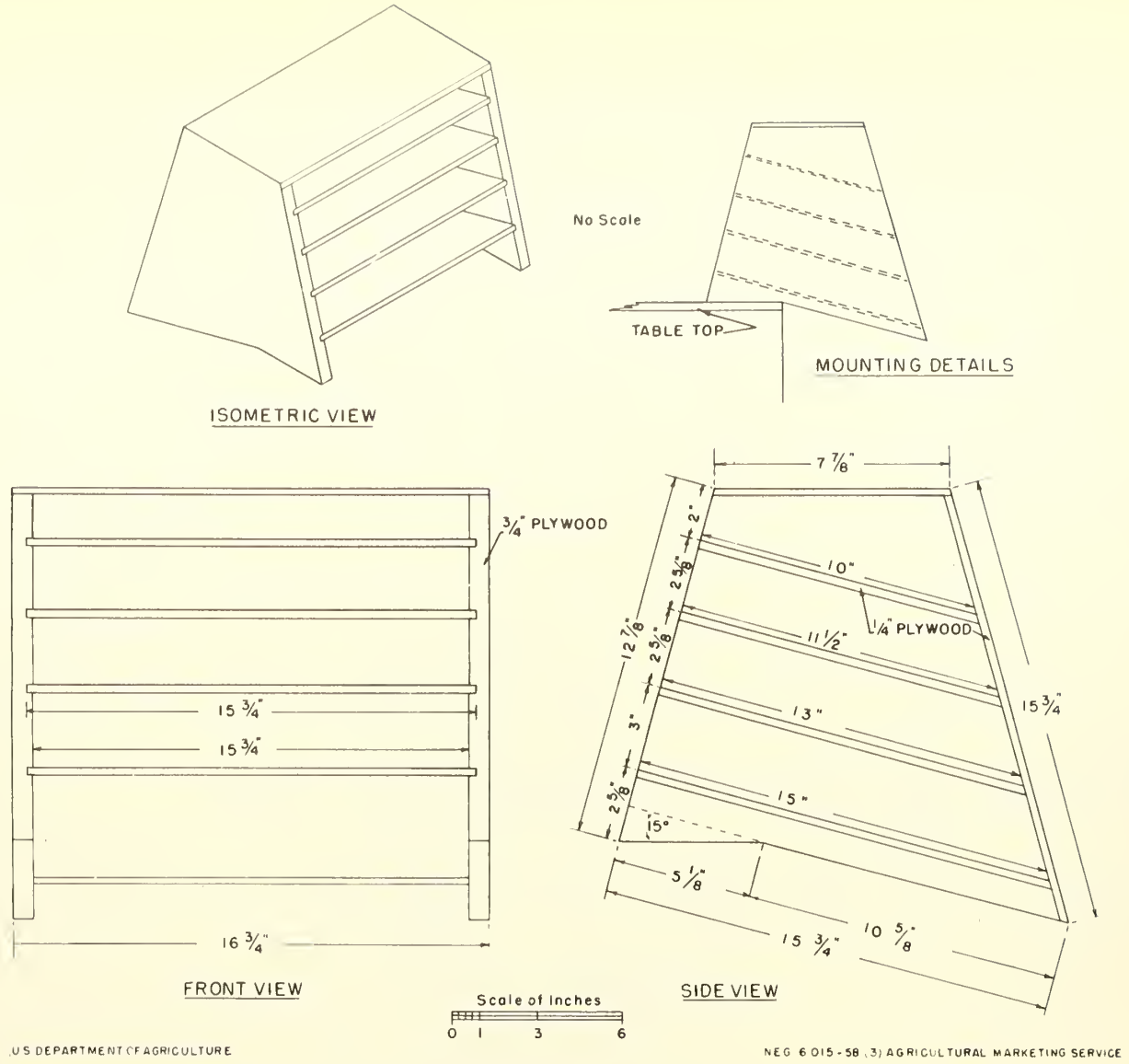


Figure 44.--Construction details for film holder for Redi-Reach-Rap table.

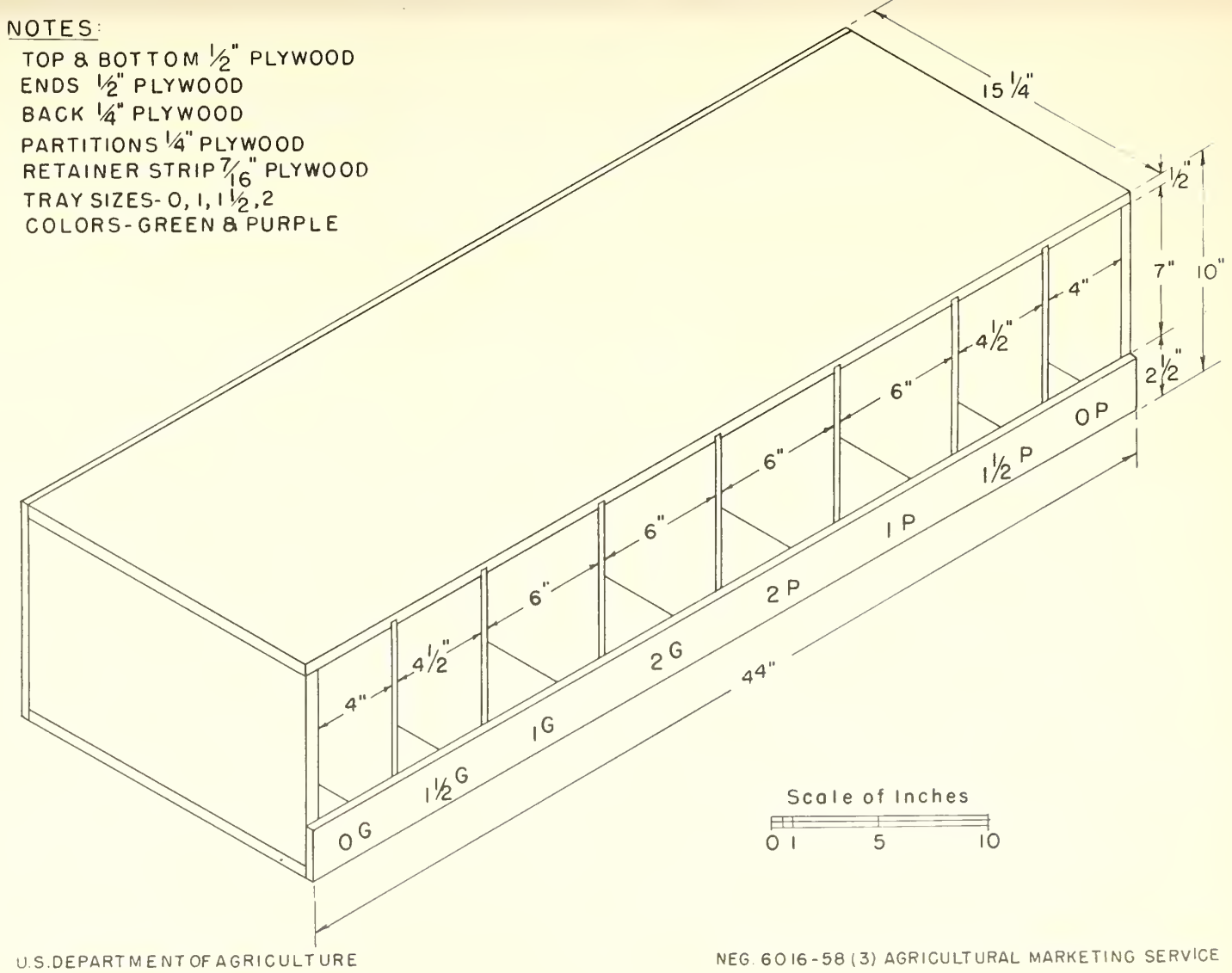
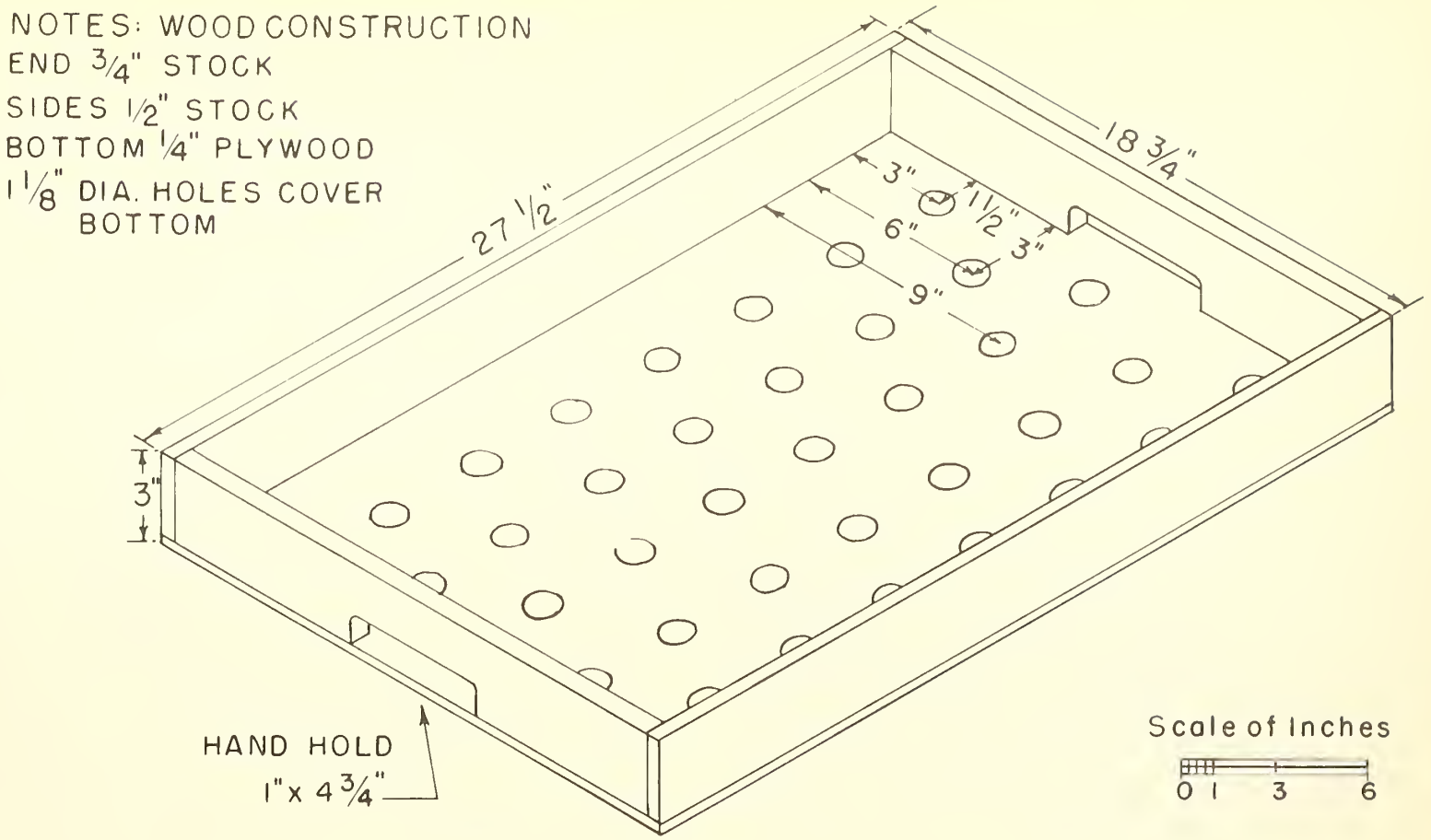


Figure 45.--Construction details for tray holder for Redi-Reach-Rap table.



ISOMETRIC VIEW

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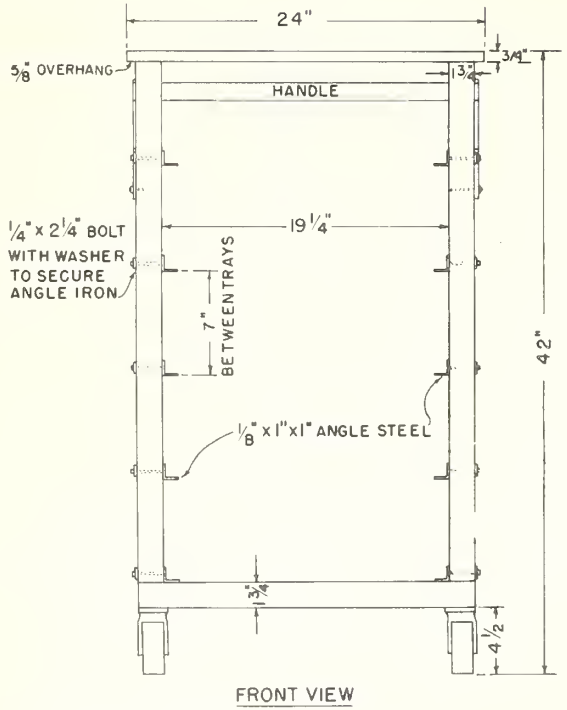
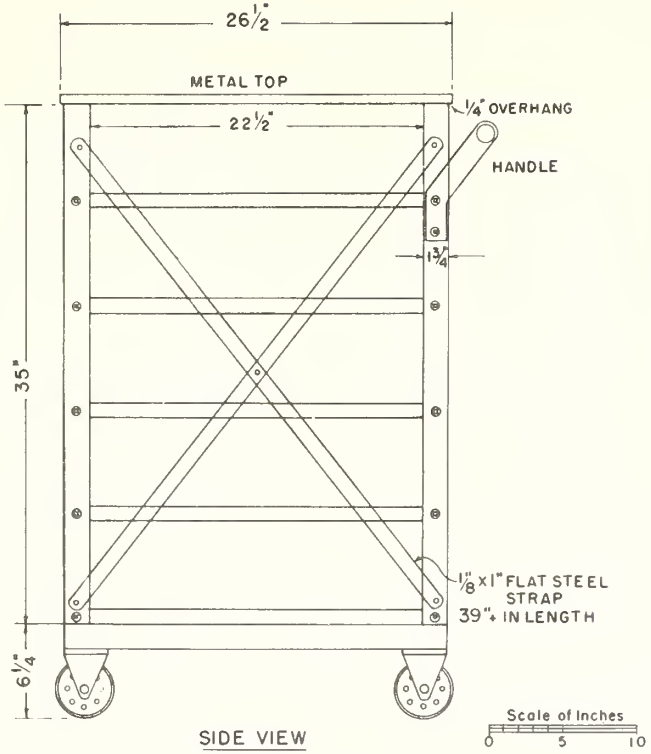
Figure 46.--Construction details for packaged produce container tray (flat).

NOTES
TRAY SIZE - O.D 18¾" x 27½" - I.D. 17¾" x 26"
BRACES FOR BACK & SIDES - ⅛" THICK x 1" WIDE FLAT STEEL (SAME FOR BOTTOM BRACE)
DOLLY WHEELS - 4" DIAM.
TRAY RUNNERS - ⅛" x 1" x 1" STEEL ANGLE - 26" LONG
UPRIGHTS & BASE - 1¾" WOOD STOCK - TOP - ¾" WOOD - METAL COVERED
BRACE FOR HANDLE - ¼" THICK x 1½" WIDE FLAT STEEL
HANDLE - 1" STEEL TUBING



FRONT VIEW



SIDE VIEW

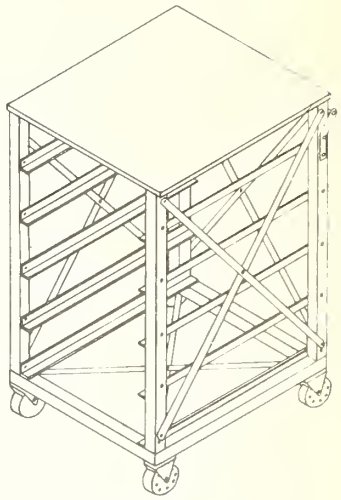

ISOMETRIC VIEW
NO SCALE

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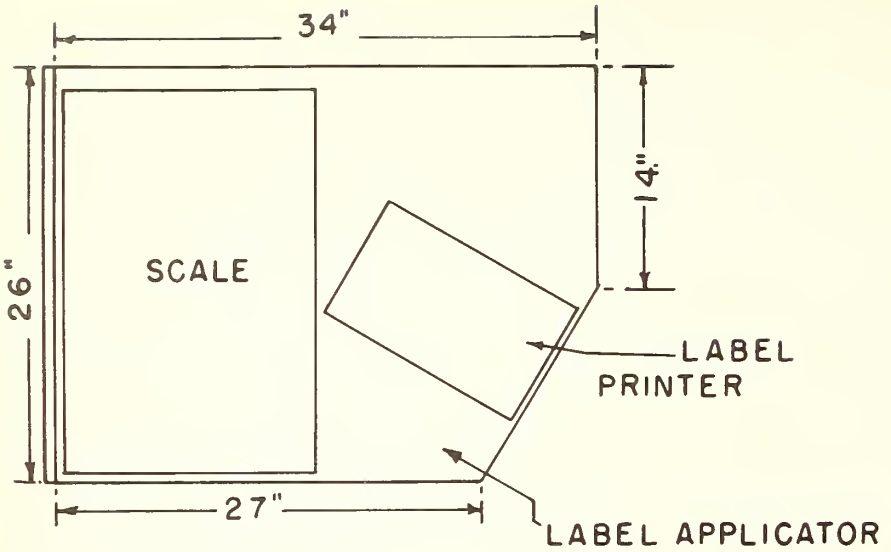
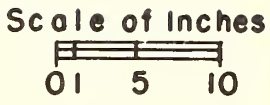
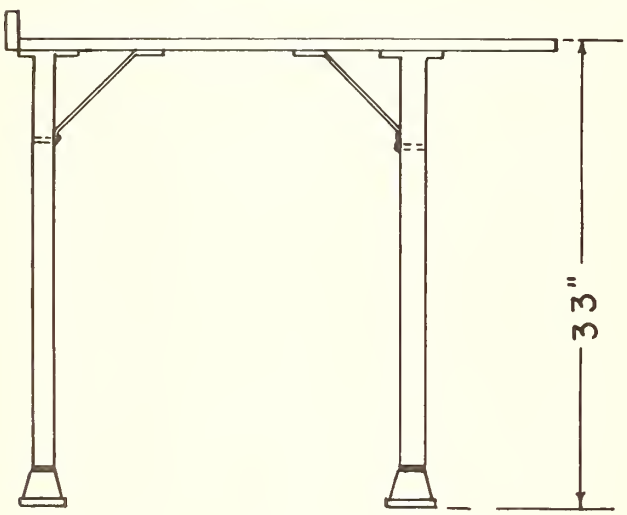
Figure 47.--Construction details for prepack produce dolly cart.







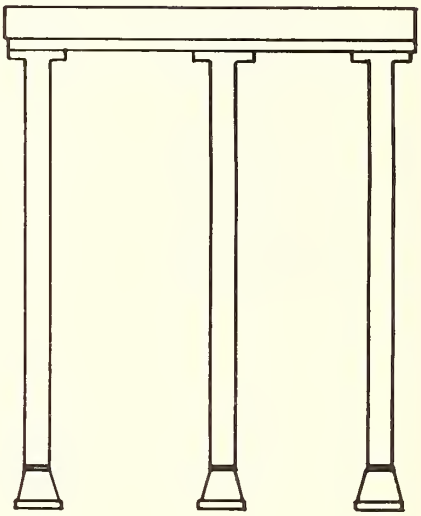


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Figure 48.--Construction details for weighing station for separate scale and label printer.

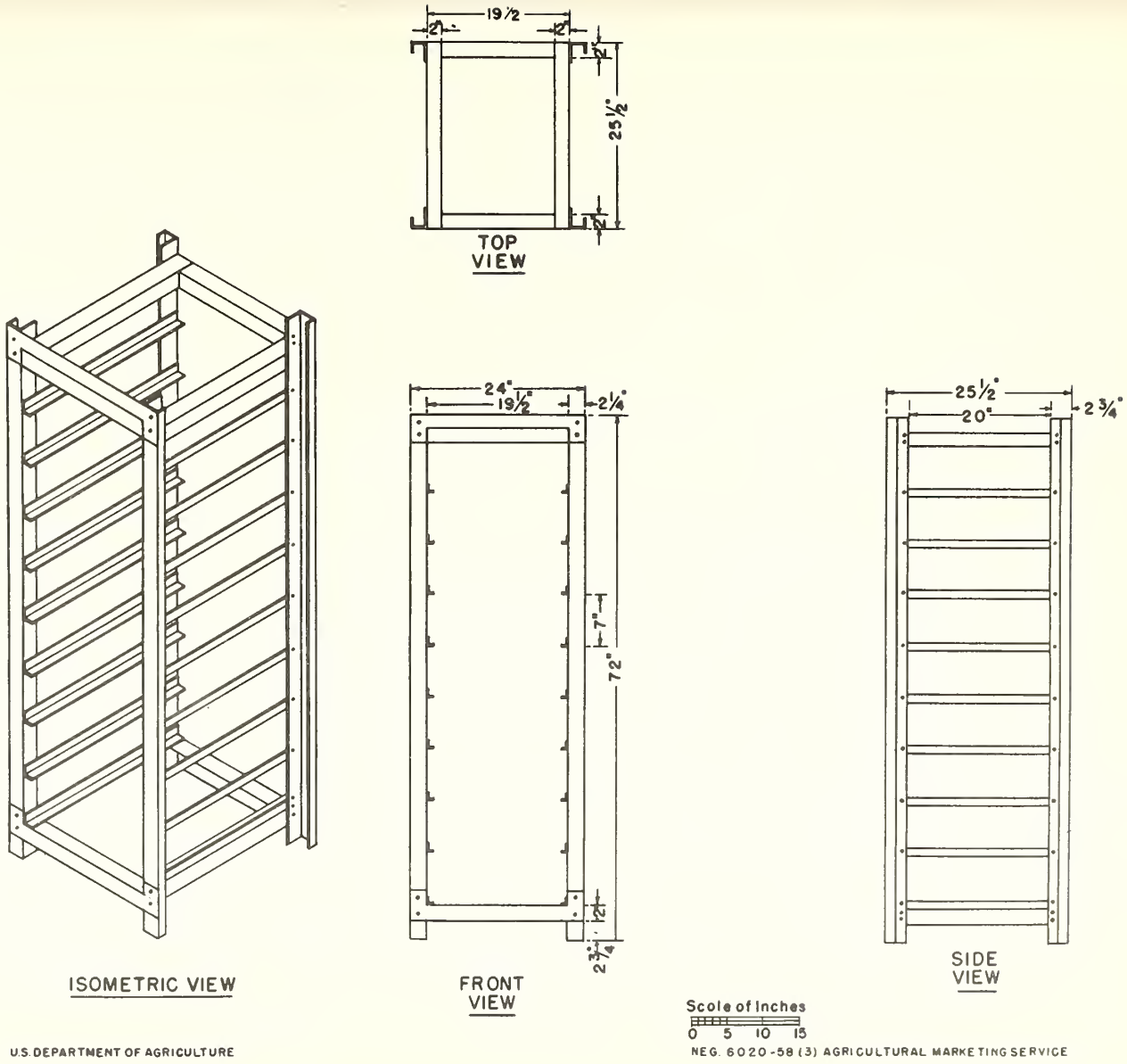


Figure 49.--Construction details for cooler storage rack.

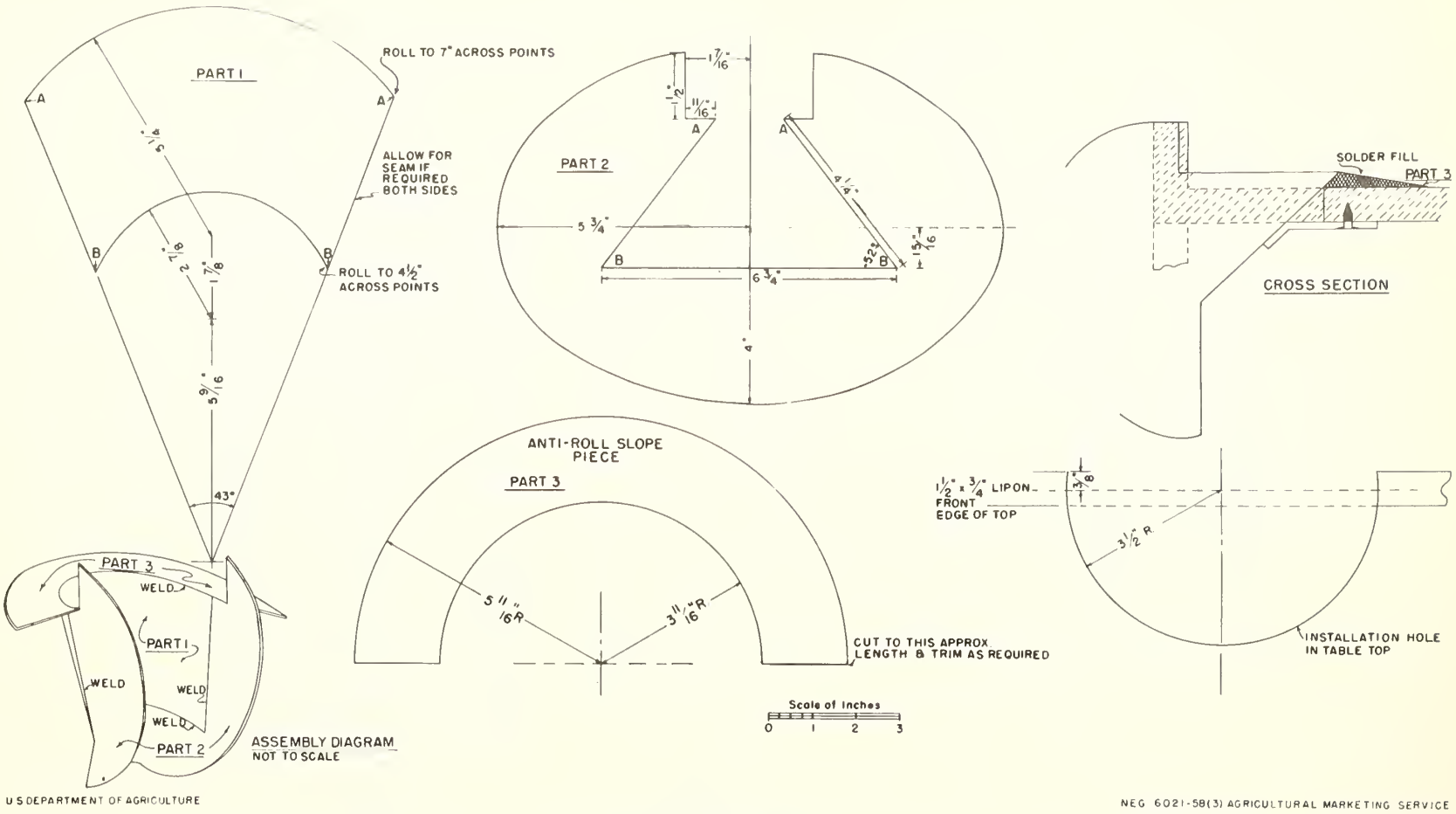


Figure 50.--Construction details for packaging funnel.

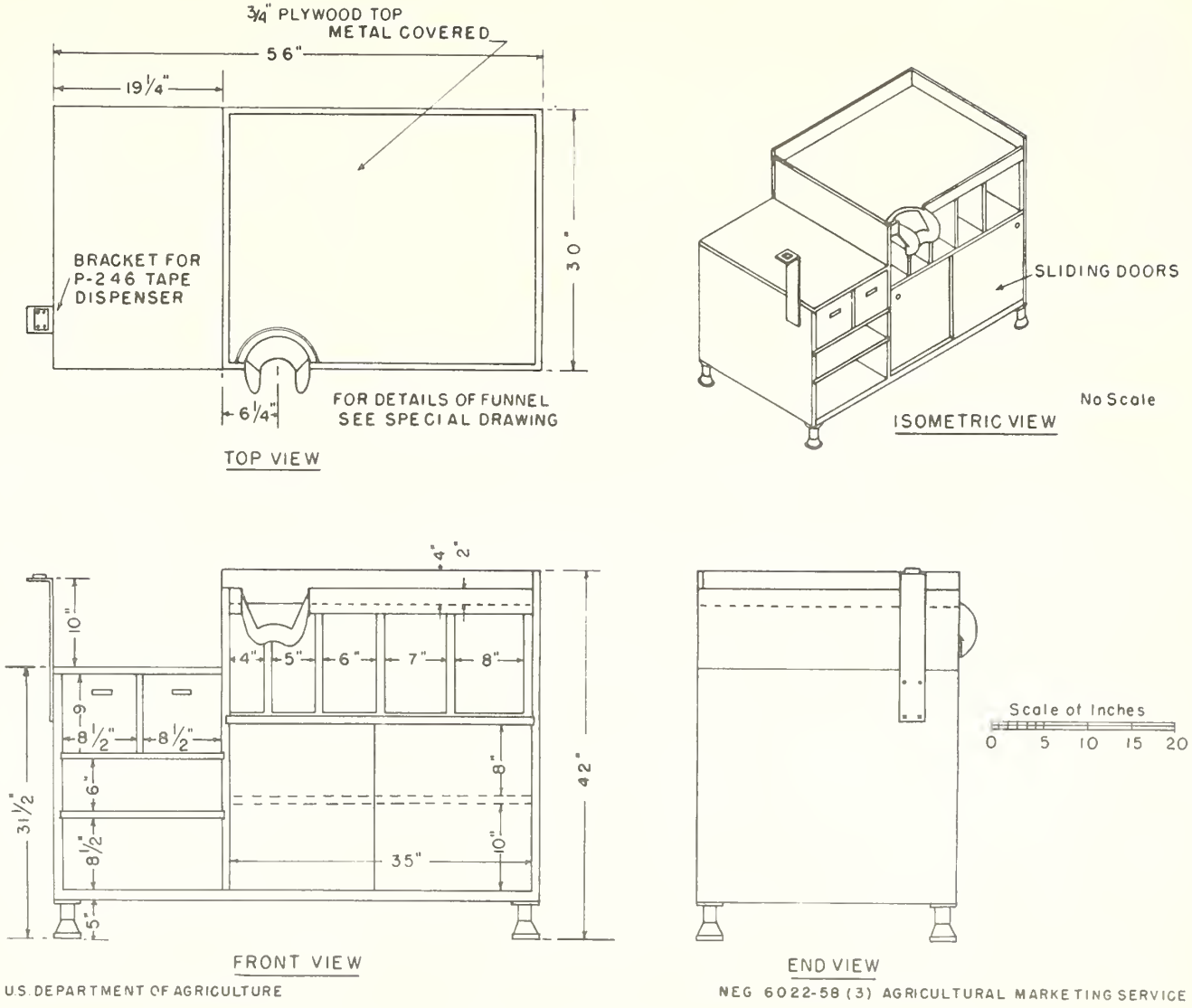


Figure 51.--Construction details for produce packaging and weighing table for back room.

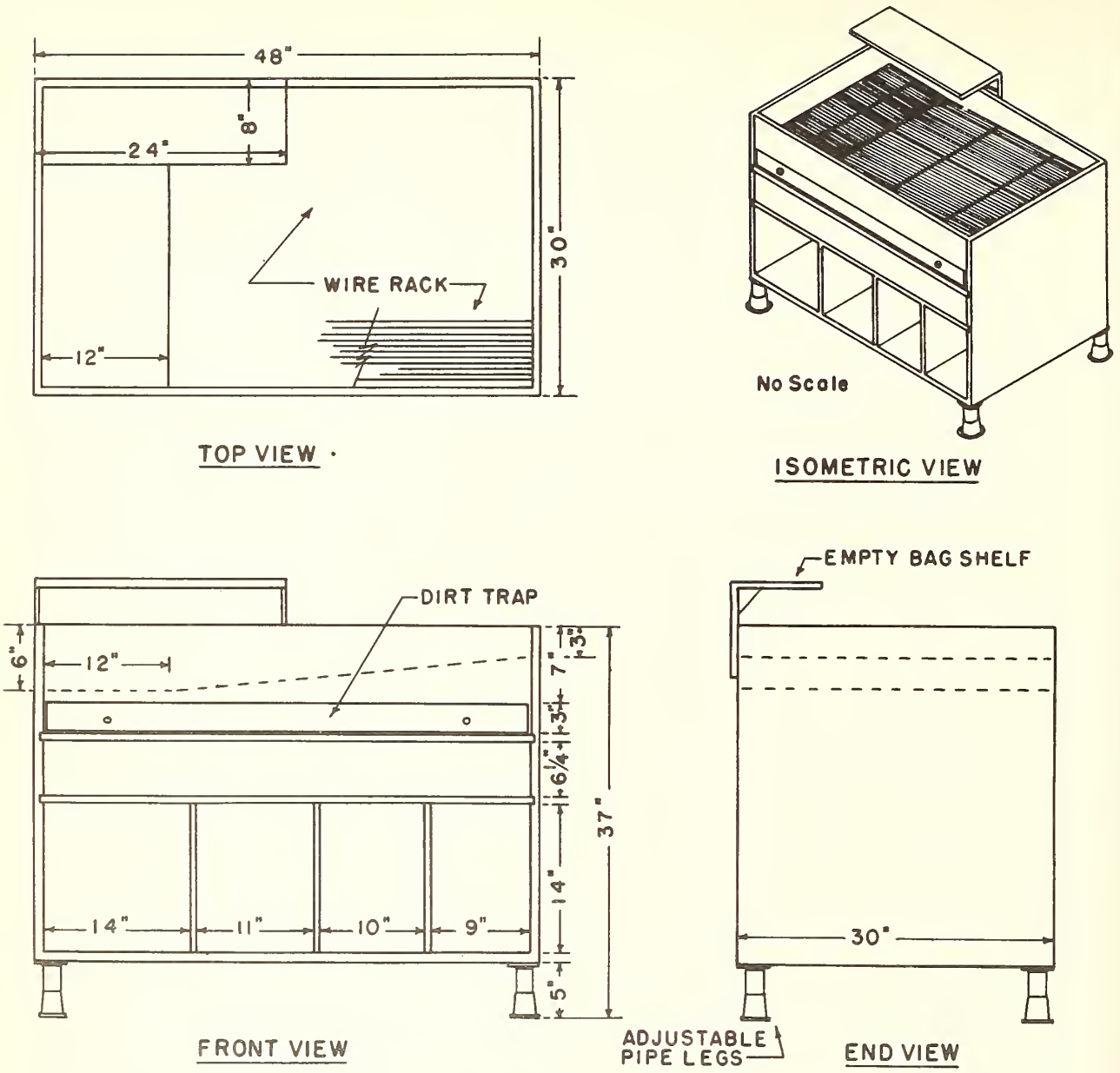


Figure 52.--Construction details for potato and onion packaging table.

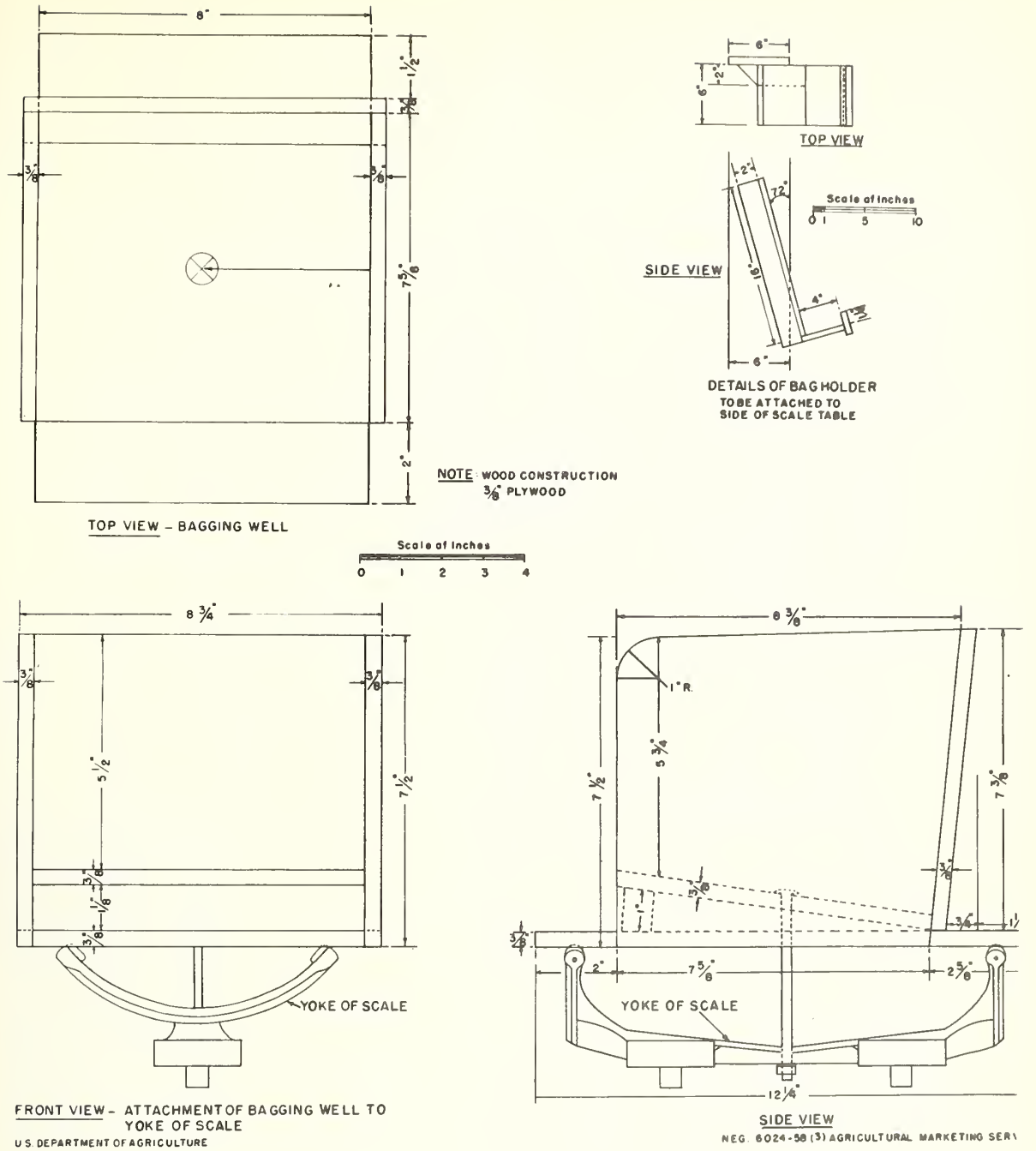


Figure 53.--Construction details for potato and onion bagging well adaptation for fan-type scale with mounting.

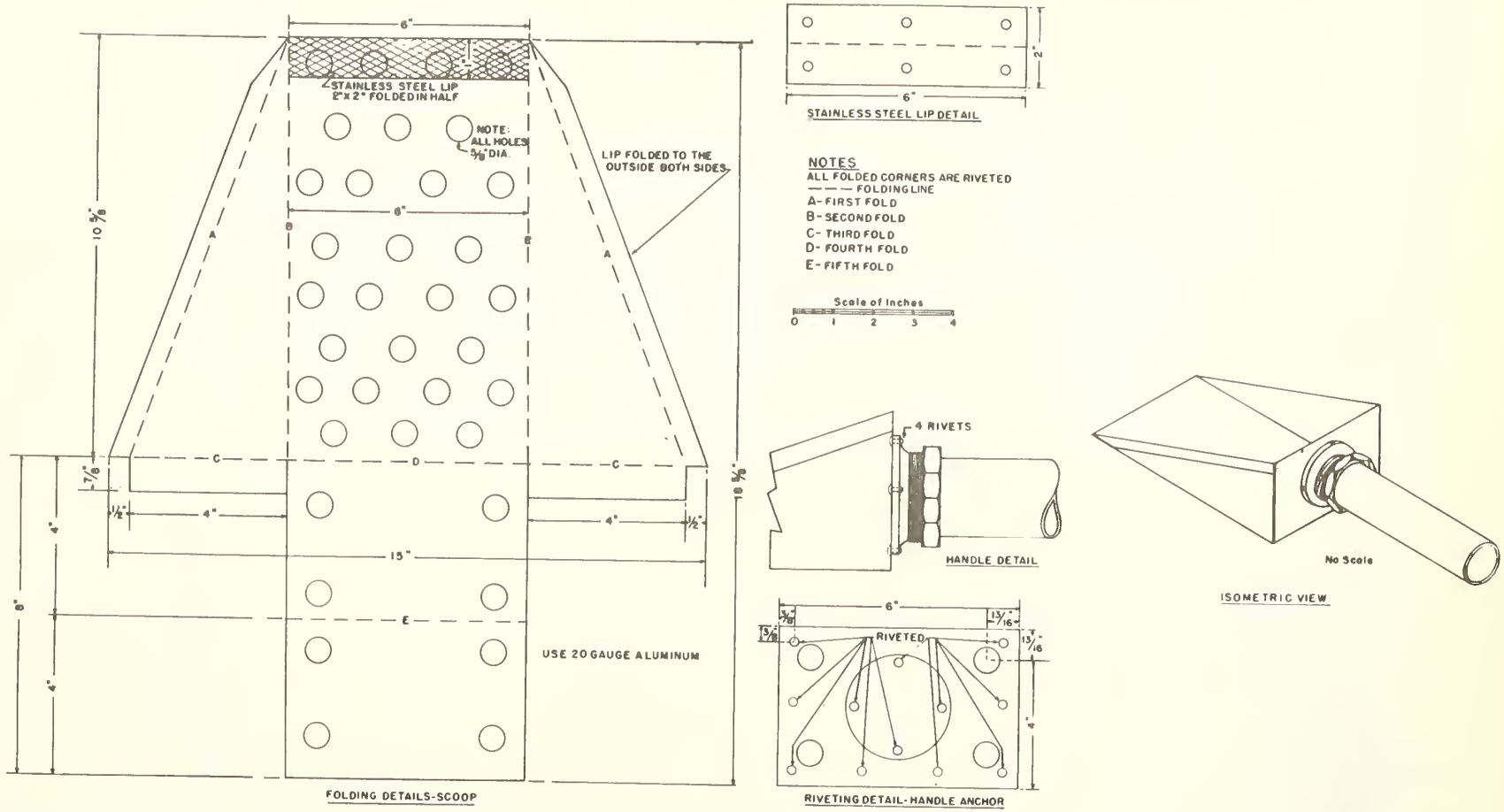
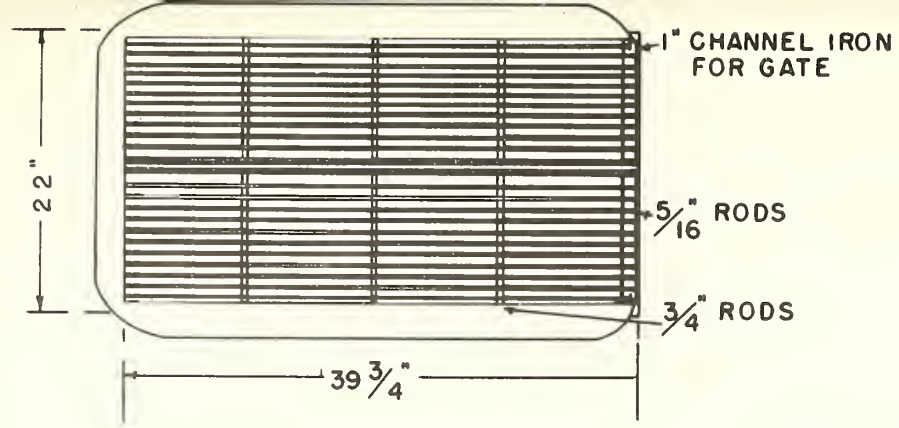
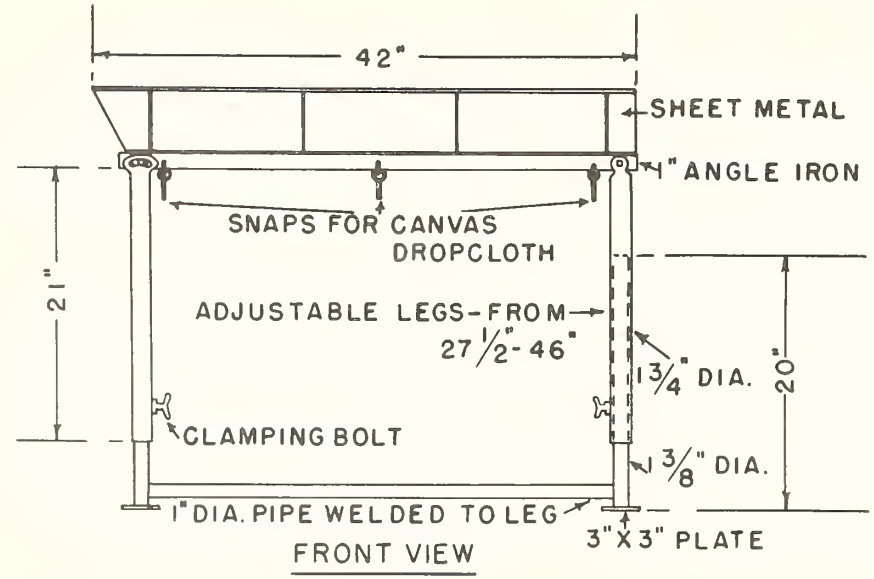


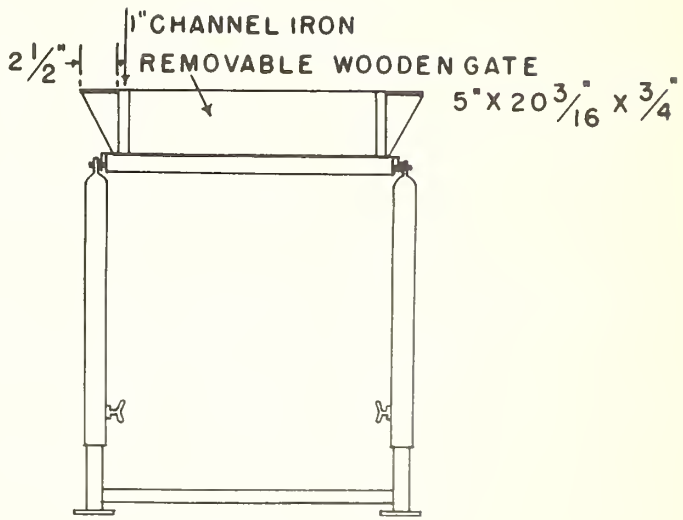
Figure 54.--Construction details for potato scoop.



TOP VIEW



FRONT VIEW



SIDE VIEW

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Figure 55.--Construction details for dump table for use with semiautomatic bagging machine.

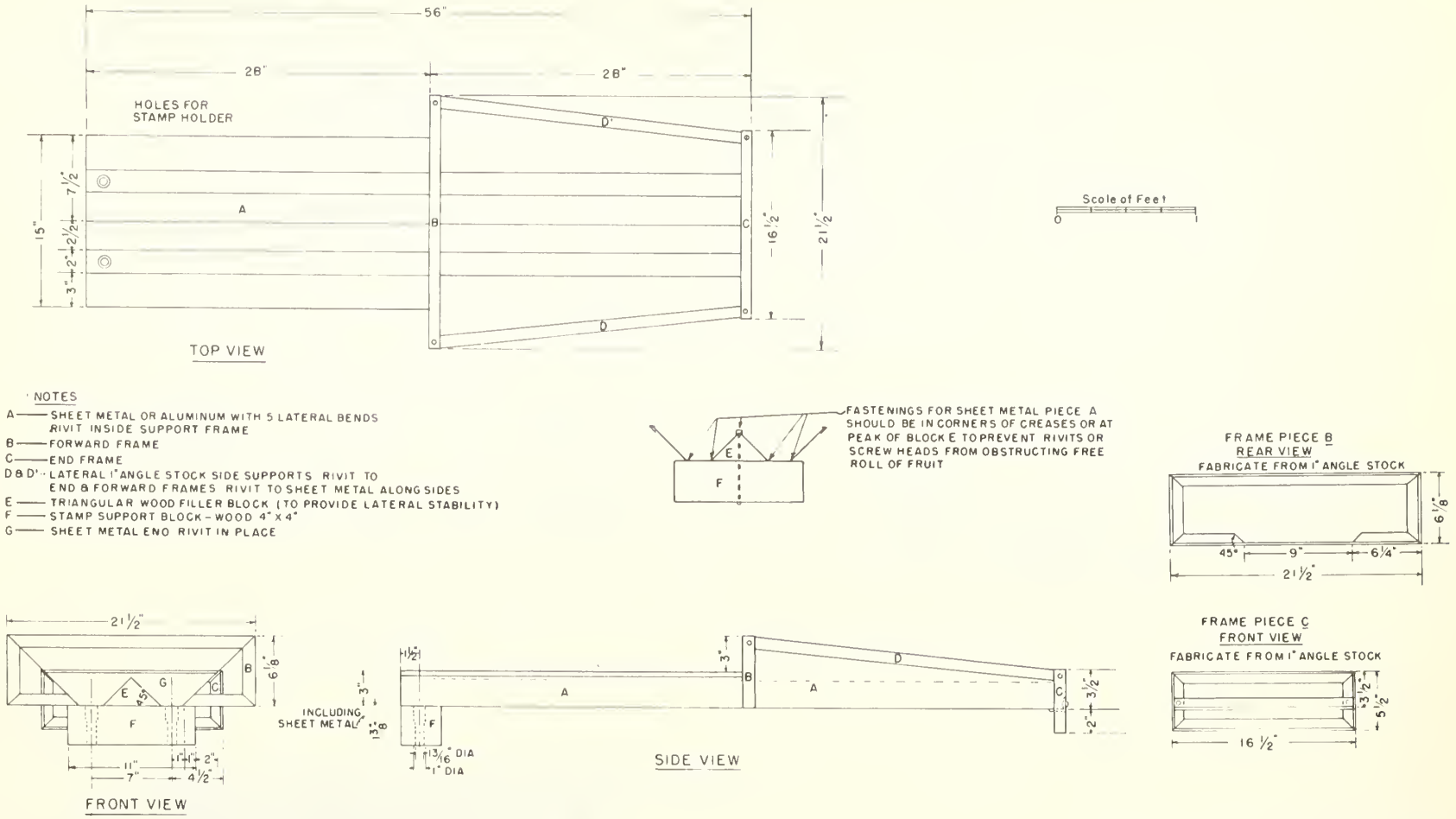
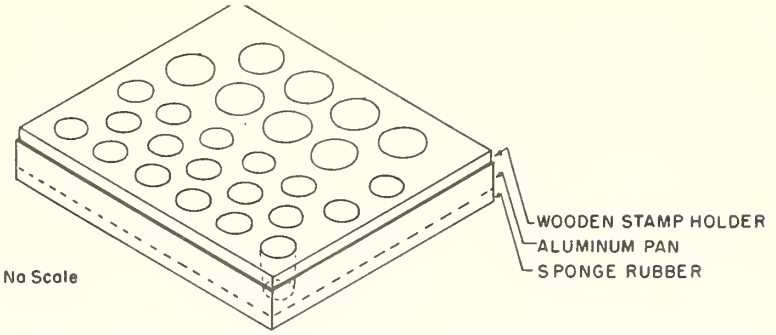


Figure 56.--Construction details for revised citrus coder for mounting on 4-wheel hand truck.

NOTE:
In a revised model, cleats are fastened to the wooden holder to make it rest on the edges of the pan about 1/4" above the rubber pad. This prevents warping of the holder. Straight cut holes are substituted for tapered holes in the holder.



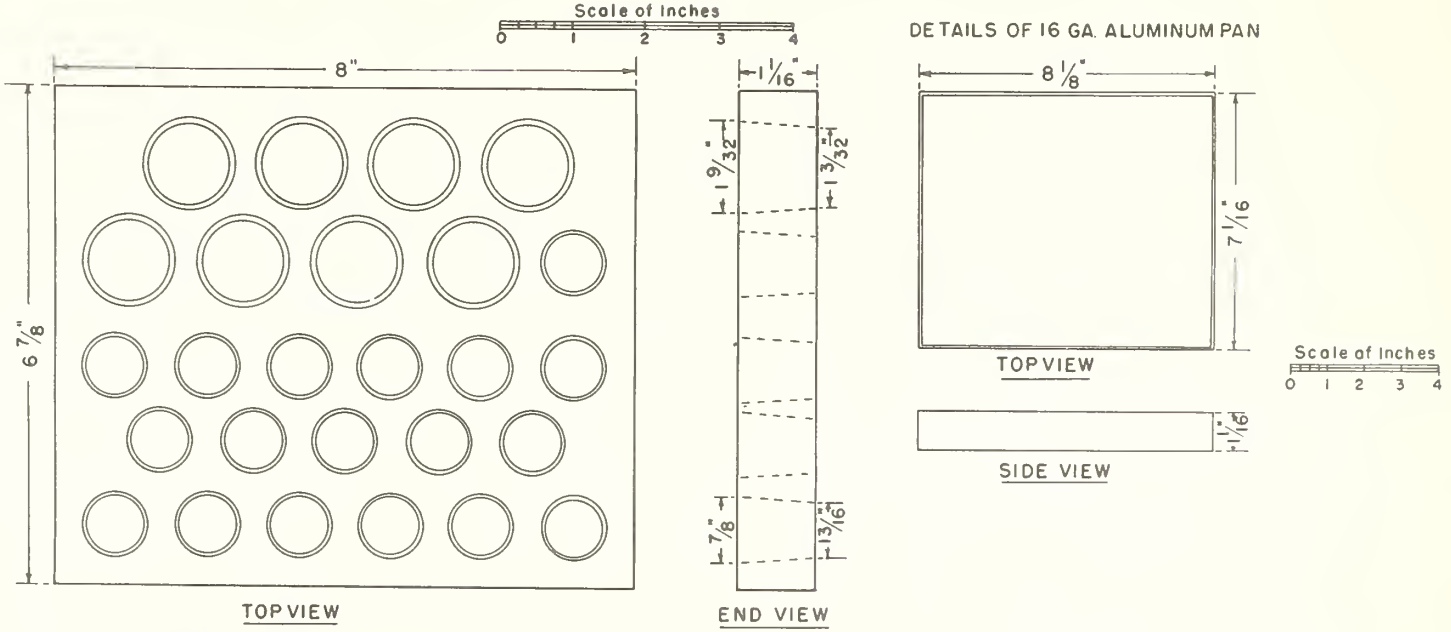


Figure 57.--Construction details for re-inking stamp holder.

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